# the Illinois Technograph

DECEMBER, 1949

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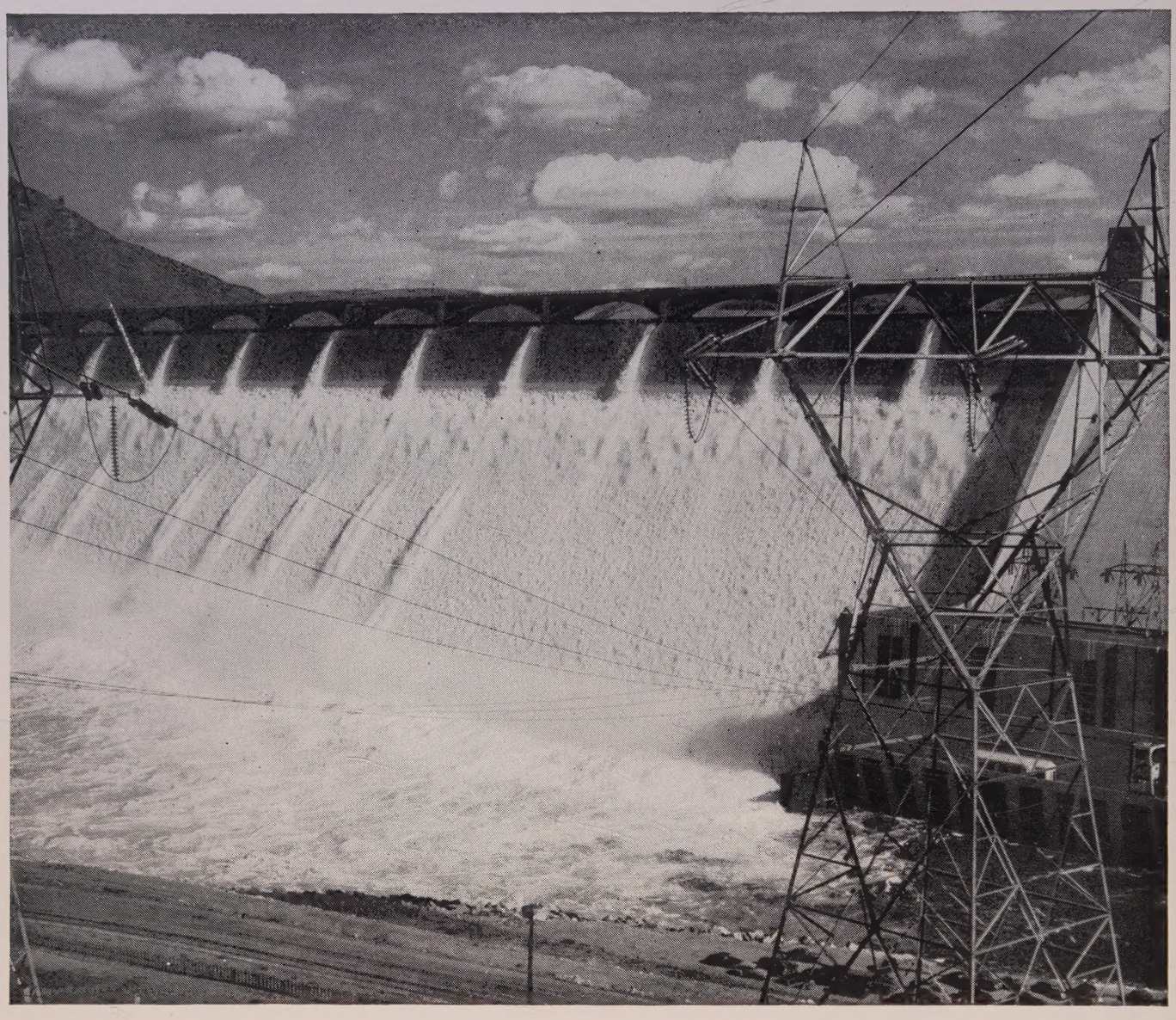
TWENTY-FIVE CENTS

# Making the "juice" that makes life easier!



DIRECTLY and indirectly, the average family in America consumes more electricity yearly than families in any other country in the world. The demand for more "juice" has grown with unbelievable rapidity, and it's *still* growing. By 1955, the electrical generating capacity of our nation is expected to reach 90 million kilowatts!

Steel is a vital material in the production of electricity. Central power stations and great power dams are made of steel and concrete. Special steels are required for turbines and other generating machinery. Steel towers carry steel-reinforced transmission lines across mountain and prairie alike.

Helping to meet America's constantly growing demands for more "juice" is only one of the big jobs ahead for United States Steel. There are many others. And they all call for the services of thousands of carefully-trained, technical specialists. For steelmaking today is a precision operation, as dependent for success on the knowledge of metallurgical, mechanical, chemical, electrical, mining, civil and ceramic engineers, as upon the plant workers themselves.

To assure employees opportunity for maximum personal development and provide a sound foundation for advancement in the organization are fundamental objectives of U. S. Steel. Employees participating in educational activities of U. S. Steel comprise a group exceeded in size only by the student bodies of a few of the nation's largest universities. In these educational programs, particular attention is given to the development of college graduates and other technically trained men.

For men who can qualify, a career with United States Steel offers a promising future.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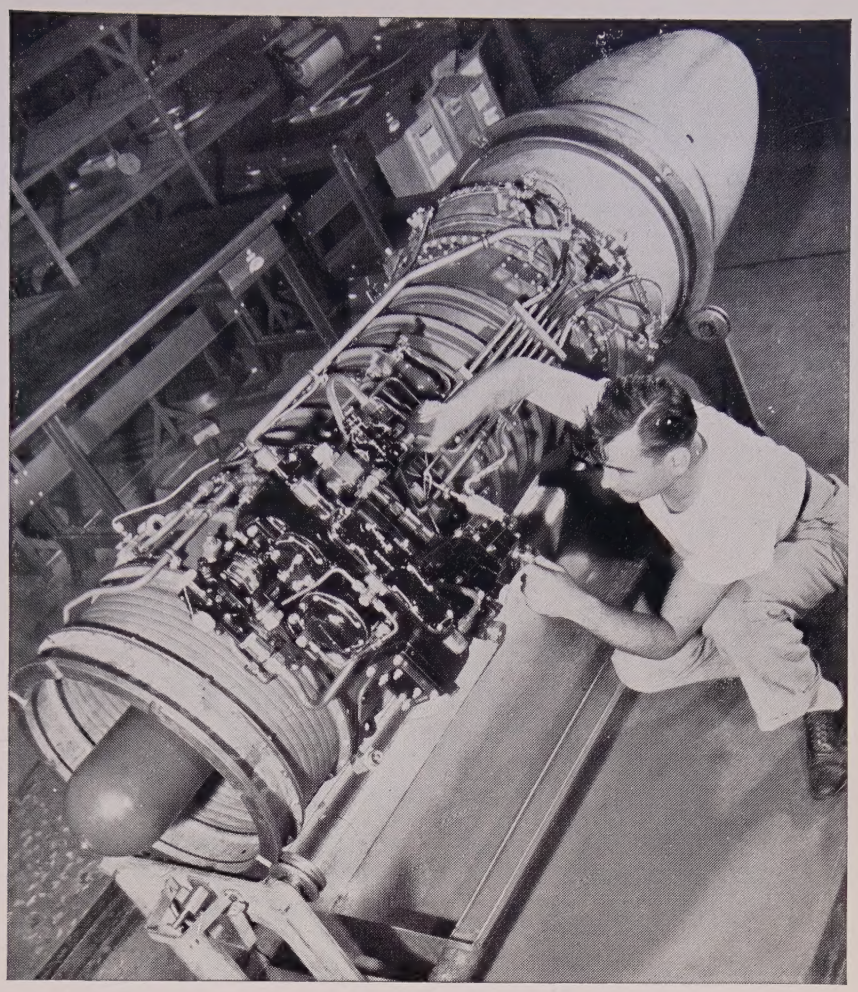
UNITED STATES STEEL

# How many Dimensions has a Name?



When you measure a name, there are many "dimensions" to consider, such as: integrity, capacity, vision, strength and skill. These qualities constitute a yardstick for professional and public recognition.

There will be many times in your career when you can increase the "dimensions" of your name by the development of a product, a method or through a decision you make.

Some idea of the dimensions of the name Westinghouse, for example, may be gained by a few facts about one of its many activities . . . building turbines.

In this field is the Westinghouse J-34 jet engine which is setting a new pace in aircraft propulsion in the much-discussed Navy "Banshee" and the Army Lockheed F-90, as well as in many other airplanes of both services—as yet unannounced.

Such developments require a rich background of experience, technical knowledge and creative skill gained through constant search for more efficient, economical sources for power . . . qualifications needed to attain the eminent position the name Westinghouse holds as a leading producer of power equipment for land, sea and air.

This is but one of many fields in which the name Westinghouse has been indelibly written over the years.

In your career you will measure many names and products in industry. As you do, you will find the name Westinghouse prominently identified with practically every one.

Whether those products are turbines or toasters, locomotives or lamps, electric stairways or x-ray machines, we will welcome the opportunity to share our experience . . . our sureness in designing and manufacturing that adds a new dimension to a name . . .

G-10069

YOU CAN BE SURE . . IF IT'S Westinghouse

# New Developments

*By Jim Ephgrave, E.E. '52*

## New Poison Ivy Killer

Poison ivy, bane of many an existence, is meeting its Waterloo in 2,4,5-T, a new hormone-type chemical related to 2,4-D. This 2,4,5-T, short for 2,4,5-trichlorophenoxyacetic acid, kills many of the same weeds as 2,4-D but is especially effective against brambles, brush, and tree stumps which resist 2,4-D.

## Ultra-Violet Microscope

Designed primarily for cancer research, an ultra-violet microscope for observing living, unstained body tissues is now in production by Bausch and Lomb.

The instrument's revolutionary objectives not only provide increased resolving power but make it possible to photograph as well as view freshly prepared sections of live tissues and tissue cultures through three different ultra-violet wavelengths. The photographs may also be projected or reproduced on color film through three visual color filters that provide densities, contrast and structural detail never before attained.

## Electronic Tempering

A tempering process which heats a metal surface from room temperature to a bright-red, 1,600 degrees Fahrenheit, and cools it again to room temperature, all within less than five seconds, has been developed by General Electric engineers.

The process uses an electromagnet which holds the part to be tempered within the field of a powerful electronic heater.

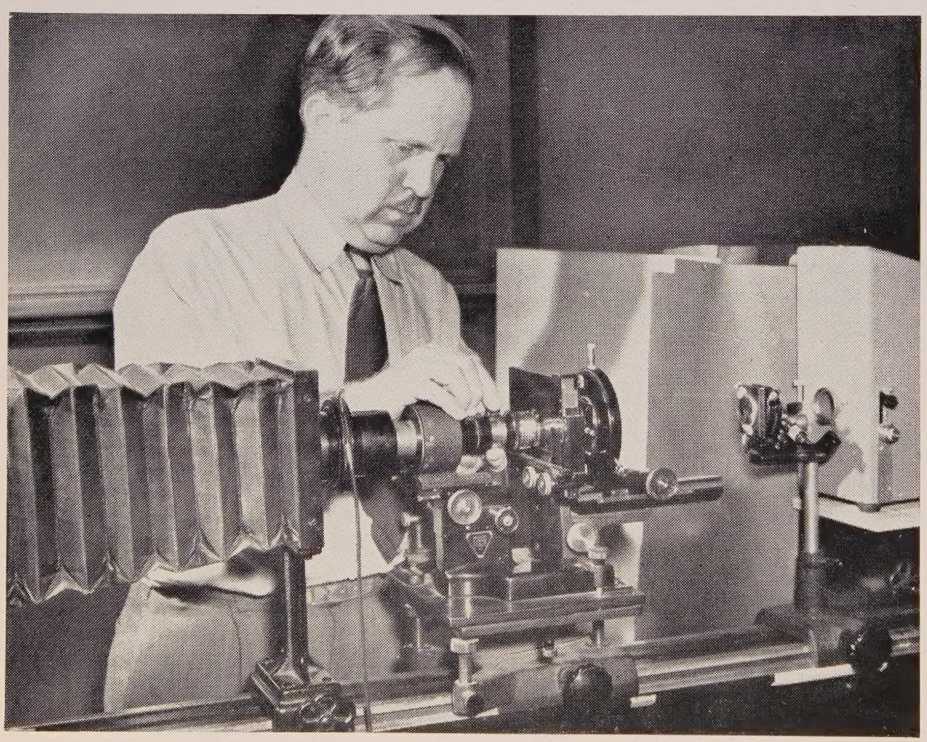
As soon as the part has been heated to the proper temperature, an automatic timing switch shuts off the electronic heater. At the same instant the current is removed from the electromagnet and the part drops into a cooling bath of oil.

The process is being used to harden the toothed surfaces of small ratchet wheels for automatic circuit reclosers.

## Bridge Control System

A powerful electric drive and control system, which raises a 1,350-ton bridge span 100 feet in 105 seconds, has been installed in the recently opened Stickel Memorial Bridge, which crosses the Passaic River between Newark and Harrison, New Jersey. Power to raise and lower the 222-foot vertical lift span is supplied by two G-E 158-horsepower, direct current motors, each of which moves one side of the span.

To keep the span level while it is being raised or lowered, an "amplidyne control system" is employed. In this system, small control units, working through a master control device, act to vary the speed of the drive motors whenever one end of the span begins to move faster than the other. This quickly-responsive leveling process begins as soon as one end of the span gets a fraction of an inch off level.



The new Bausch and Lomb ultra-violet microscope will be used for the further investigation of cancer tissues. (Photo courtesy of Bausch and Lomb)

## Recording Spectro-radiometer

More colors of light beams than there are grains of wheat in Kansas can be distinguished by an instrument developed by General Electric scientists and engineers.

The color-sensitive instrument, known as a "recording spectro-radiometer," has been designed for use in comparing and recording the colors of light sources. It breaks up beams being studied into the various colors of which they are composed; measures the intensities of these colors; and makes a permanent record of the measurements in the form of a graph.

The instrument draws a curve showing the distribution of colors in a given light source in less than a minute. Production of such curves by methods used in the past required a series of long and tedious, point-by-point measurements.

## High-Speed Drones

The shooting eyes of the U. S. Navy's anti-aircraft gunners soon will be put to the test by the antics of a pilotless, radio-controlled, ram-jet-powered Martin KDM-1 target drone darting through the skies at speed close to that of sound.

A 20-inch Marquardt ram-jet engine will furnish the power for the air-launched KDM-1 target.

The ram-jet engine, sometimes called the "stovepipe," has no moving parts. A fuel pump used on earlier engine models will be replaced by a pressurized fuel system, eliminating the single moving part on the first ram-jets.

## 'All Weather' Jet

Development of the nation's first "all weather" jet engine for military aircraft has been announced by the General Electric Company.

An experimental model of the turbo-jet already has been built, and its new

(Continued on Page 24)

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# the Illinois Technograph

**Volume 65** **Number 3**

## The Tech Presents

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### OUR COVER

Cartoonist Ed Lozano shows secret pages from the daily lives of the civil engineers on this month's cover. These red-blooded American boys enjoy the clean, healthful, outdoor living.

### FRONTISPIECE

Power, power, and more power! This montage shows modern engineering in some of its most impressive phases. (Photo courtesy of Westinghouse)

# The Abbott Power Plant

**By Dan Keefe, Ch.E. '50**

*A good provider of heat and electricity is the Abbott Power Plant. Besides supplying the University with plenty of steam, the facilities make possible a realistic application that is meaningful. Students in the Mechanical Engineering Thermodynamics laboratory courses run a 24-hour test on the power plant's operation.*

Out in the southwest part of our campus, where few can see it, is a building with a very tall chimney—a building that plays a major part in the operation of the University. This building is the Abbott Power Plant; it is on Gregory Drive next to the Illinois Central tracks.

*From the Old*

In 1936 it became clear that the old power plant (located near the M. E. lab) would not be able to meet the requirements of the planned University expansion. The old plant was a two-boiler unit when it was put into service in 1902. It was enlarged several times as the University grew; and, in its final form, was a 150-pound operating plant containing eight longitudinal drum, stoker-fired boilers. It had inadequate generating capacity and an obsolete 2,300-volt electrical distribution system. As a matter of fact, it had become necessary to purchase power from the Illinois-Iowa Power Company.

To add to this already unfavorable condition, the designs for new buildings indicated that there would be a large increase in the steam consumption. It would have been possible to remodel and modernize the old plant, but a survey and report by Sargent Lundy (consulting engineers) showed this to be uneconomical.

*To the New*

Construction of the present-day plant was begun in January, 1940, and was completed in February, 1941. It was operating, however, in parallel with the old plant as early as September, 1940.

Some indication of the success of the plant is the fact that the operating costs dropped about 10 per cent, and that the University began selling its surplus electric energy during the winter season to the Illinois-Iowa Power Company.

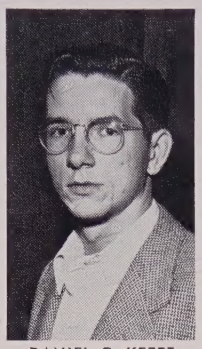
The plant is located, as mentioned before, next to the Illinois Central tracks. This location has two advantages: a railroad siding is readily available for the handling of coal in carload lots; and the plant is in a central position for any further expansion of the campus, which is expected to be toward the south.

Dan Keefe is a senior in Chemical Engineering and a freshman on the Technograph staff. His main interest in the industrial line is plastics and he has hopes of getting into that field when he graduates next August.

He was born in Chicago in 1927 but has spent the most of his life outside the city.

Dan is an active member of A.I.Ch.E. on campus and represents that society on the Engineering Council.

He came to the U. of I. in the spring of 1947 after being discharged from the Army.



DANIEL G. KEEFE

Coal handling in the plant is accomplished by a 12′ x 14′ track hopper into which the coal is fed from side- or bottom-dumping cars. A reciprocating feeder supplies an apron conveyor, and the coal may be taken from this point to be crushed, if necessary; or it is raised by a vertical bucket conveyor to an overhead, cross-conveyor, and then into one of four Gunite-lined, rectangular coal bins of 100-ton capacity each.

*Power Production*

At the presnt time, the plant uses three General Electric 3,000-*kw* turbine-generators to supply power. Two of the units are automatic extraction-condensing turbines; and the third is a non-condensing unit. All three of the turbines operate at 3,600*rpm* with throttle steam conditions of 300 *psi* and up to 700 °*F* total temperature. The three generators have the following characteristics: 4,160 volts; 3 phases; 60 cycles; and 3,000 *kw* at 0.8 power factor, or 3,750 *kva* at unity power factor.

One condensing unit supplies heating steam at extraction pressures up to 70 pounds, with exhaust to a 2,500-*sq. ft.* Allis-Chalmers two-pass surface condenser at 28 *in. H g* vacuum. The newest condensing unit has a Worthington condenser capable of condensing 38,000 pounds of steam per hour.

Since the plant is not located on or near a plentiful water supply, such as a river, the condenser circulating water is cooled by induced draft fan cooling towers. The water is cooled by the combined effects of evaporation and direct air cooling. Evaporation losses are made up from well water which has been previously softened by the power plant water treating system.

There are four boilers in the plant. Three are Springfield, cross-drum, straight tube boilers rated at 80,000 pounds of steam per hour and a total temperature of 700 °*F*. The other is a Babcock-Wilcox, four drum, bent tube boiler rated at 80,000 pounds of steam per hour, with about the same temperature as the Springfields. It was designed for a pressure of 350 *psi*, and firing is accomplished by Babcock-Wilcox chain grate stokers.

One of the plant's biggest operating advantages over the old plant is a boiler efficiency around 80 per cent. The best obtained before was about 65 per cent.

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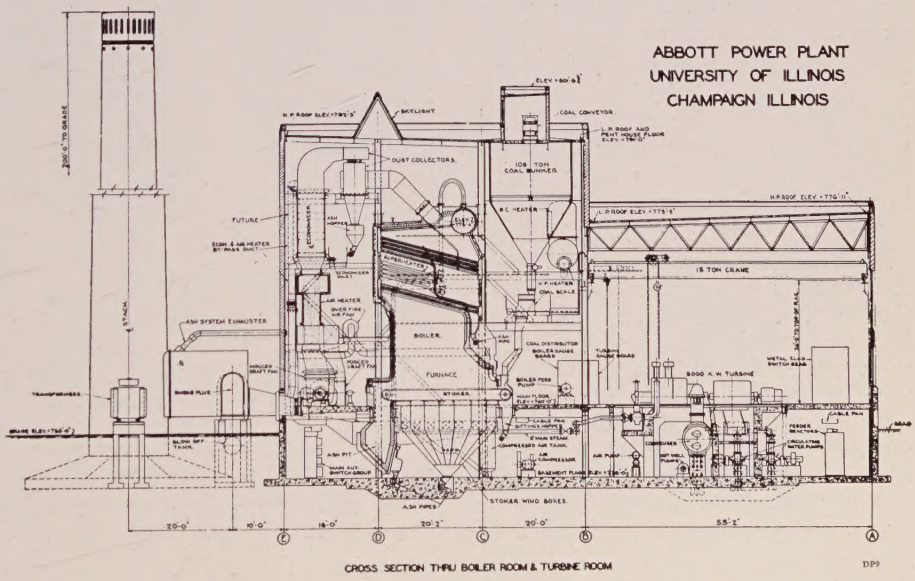
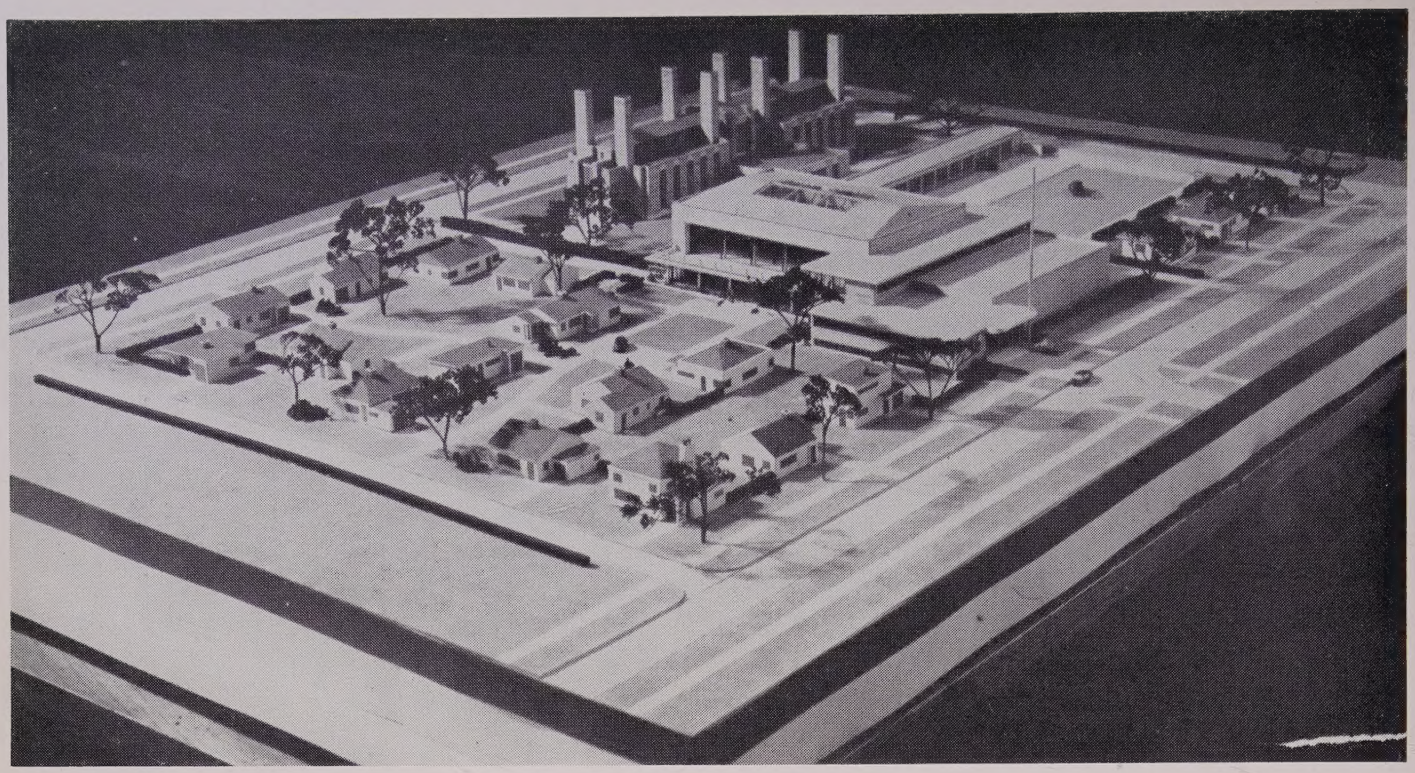



A cross-section through the boiler and turbine rooms shows an elevation of the mechanical equipment



When completed, the Research Center of the Small Homes Council will occupy a four-block area between Armory Avenue and Gregory Drive in Champaign. (Photo courtesy of Small Homes Council)

# Small Homes Council

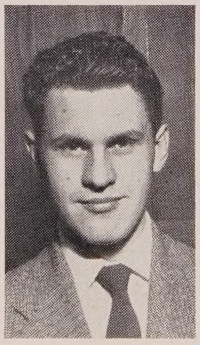
**By Dave Cash, Ag.E. '51**

*A big job is being done by the Small Homes Council on campus; and their work is of interest to anyone who wants to make his home more livable. Through cooperation with research departments of the University and industrial organizations, they have proposed and assembled much useful information about construction methods and home design.*

Slightly to the southeast of David Kinley Hall stands Mumford House, the oldest building on the University of Illinois campus and the headquarters of the Small Homes Council. Built in 1870 as a model farmhouse, Mumford house reflects the University's early interest in architectural research.

The University of Illinois Small Homes Council was organized in September 1944. Its purpose was to investigate and attempt to solve housing problems by research into planning and construction methods. The Council was founded upon the idea that eventual improvement in housing must depend upon a general advancement of knowledge in every type of problem.

All departments of the University whose work is related to housing are cooperating in the various projects. To these departments, the Council is the coordinating agency.



DAVID E. CASH

David Cash is on his fourth year of a five-year-plan in General Agriculture and Agricultural Engineering. He is most interested in farm machinery, and will be interested in manufacture and design of farm implements when he graduates.

Dave was born on a farm near Harvard, Ill., in 1929, where he has spent most of his life.

He came to Illinois in September, 1946, but did not become a member of the Technograph staff until this year. He is a member of A.S.A.E. and A.F.S., and is vice president of McKinley Foundation Student Council.

The Small Homes Council has been headed by William H. Schieck, professor of architecture, since its organization.

Professor Schieck is at present on leave from the University to serve as the executive director of the newly organized Building Research Advisory Board. During his absence James T. Lendrum, associate professor of engineering drawing and associate director of the Council, is serving as acting director.

The Council has a three-point program: Research, Information, and Education.

In 1946 the Home Research Center was established by the Small Homes Council. The Center provides facilities at one location for intensive research in low-cost, family housing units. When completed the Research Center will occupy a four-block area between Armory Avenue and Gregory Drive, west of First Street, in Champaign. It will provide facilities for all phases of housing research and education.

At present the Home Research Center contains a testing laboratory, two research houses, and the Small Homes Council Laboratory for planning research. The completed Center will include a main building, or demonstration center, a production yard, and research and experimental houses.

The main building will contain a large laboratory, shops, exhibition spaces, a large lecture room, and offices. The production yard west of the main building will be used for the study and demonstration of construction practices.

The research houses will be constructed and studied in cooperation with industrial organizations. These homes will be designed chiefly to carry out experiments in specific problems of housing improvement. Site planning, landscap-

ing, and land usage can also be studied and demonstrated.

The first of the two existing research houses was built in 1947 to study warm-air heating. Built as a co-operative project with the National Warm Air Heating and Air Conditioning Association, the 5½-room one-story house is typical of thousands now being built. The Association has maintained a similar research home near the campus for 22 years. The new house is completely furnished and is occupied by a research associate. Recently the Association opened Research Residence No. 3 in north Champaign.

The basement of the other research home is being used for several other heating studies, principally in connection with a solid fuel study. Planning and design of homes heated by coal or coke is being carried on by the University Department of Architecture in cooperation with Bituminous Coal Research Inc., the Anthracite Institute, and the American Coke and Coal Chemicals Institute. Studies include location of the central heating plant and the fuel bin, the removal of ashes, and the practicality of a sloping bottom fuel bin. Also being studied is the furnace in the house — one of the new Illinois smokeless furnaces, developed by Prof. Julian R. Fellows of the College of Engineering.

Sometimes as important as engineering facts are family reactions. A three-person family is living in this house to determine the livability of a one-story house with only 768 square feet of floor space.

In cooperation with the Lumber Dealers Research Council, the Small Homes Council is undertaking a research study directed toward giving home-owners economy and variety in house design through standardized quality construction. Time studies previously made on the actual construction of 40 engineered houses are being used as a basis for the research. The project is studying and developing a series of standard room units which can be arranged easily and economically in a number of complete house plans. A series of basic plans will be distributed to lumber dealers throughout the country.

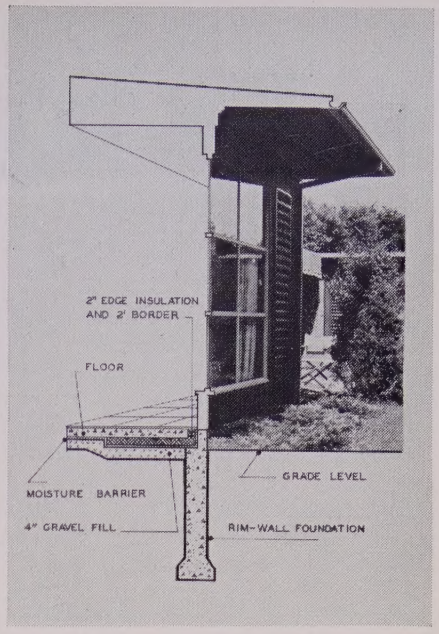
To advance the technology of small house construction and to increase the efficiency of the contractor, the Small Homes Council conducted a time-study of construction and assembly methods in cooperation with the U. S. Department of Commerce Office of Technical Services. This study, conducted in 1947 and 1948, concerned such factors as organization of the construction job, flow of materials to the job, handling of materials at the site, and construction techniques used by the contractor and his building mechanics.

Six houses of the same plan and design were built. They were constructed two at a time—one frame and one brick. When one pair was well under way, another pair was started. Lessons learned in the construction of one pair were carried over in an attempt to improve construction on following pairs.

These houses, located on Hessel Boulevard in Champaign, were research houses only during their construction and were turned over to the University for staff housing upon their completion.

A research investigation was done on a house built for sale by the Structural Clay Products Institute on non-modular masonry construction. This consisted of a time study to obtain data on construction time of those parts of the work affected by non-modular masonry.

A study of the building of concrete floors for basementless houses was undertaken as a project in cooperation with the U. S. Department of Commerce Office of Technical Services in 1947. A windowless testing shed 75 feet long was built at the Research Center. This shed was divided into a series of rooms, each insulated from the adjacent rooms. The rooms, or cells, were each heated electrically; and each room contained instruments to measure floor temperatures and moisture conditions. The actual investigations were done by the Engineering Experiment Station.




This is a recommended concrete floor construction, based on an investigation of floor slabs. (Photo courtesy of Small Homes Council)

Under a $12,000 research grant from Hotpoint, Inc., the Council and Agricultural Experiment Station's Departments of Home Economics and Agricultural Engineering made studies of convenience

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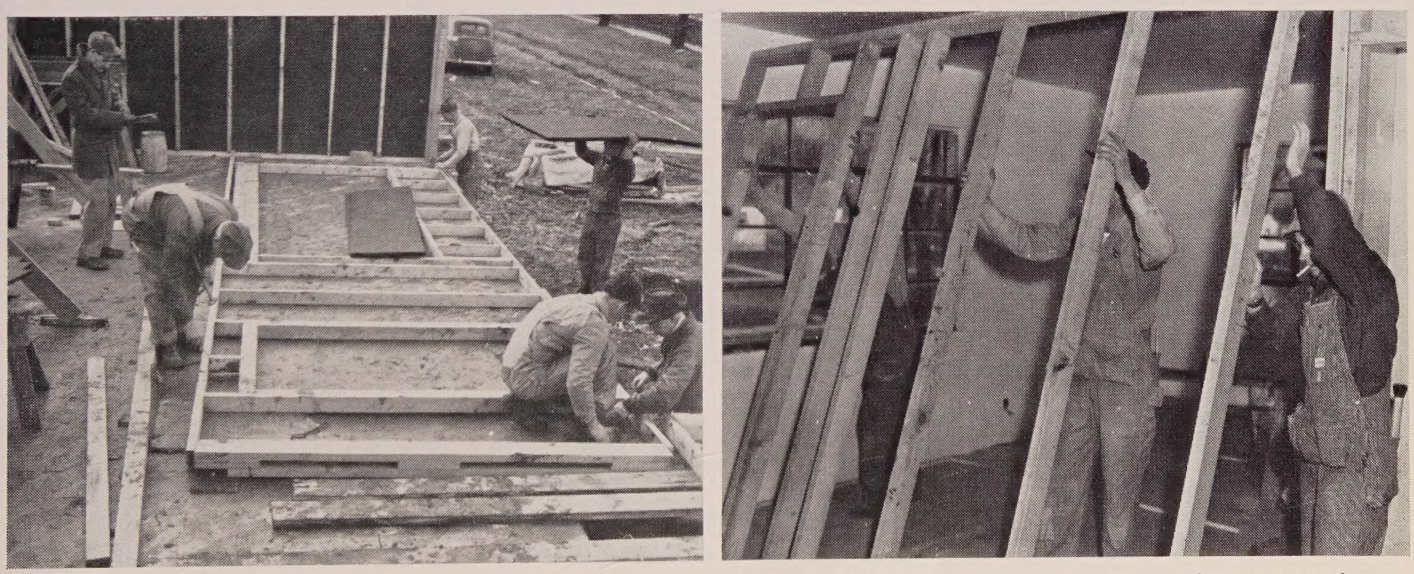


One of the main objectives of the Small Homes Council is quick and efficient construction as demonstrated by the ease with which the partition in the above pictures is tipped into place. (Photo courtesy of Small Homes Council)

# The Talgo...Train of Tomorrow

**By Dick Choronzy, M.E. '51**

*It has been said that the train of tomorrow is a long way off into the future. However, a "mystery" train, the Talgo has roared its way into the news. Built with a low center of gravity, people sitting in the train are no higher than people standing up outside the train. Constructed of light aluminum alloy, the new train is capable of whipping around curves without slackening speed. The following article presents the development and the engineering features of the Talgo.*

Once upon a time a Spanish army engineer named Lieutenant Colonel Alejandro Goicoechea Omar, decided that railroad equipment must be made simpler and lighter. Impatient with complicated and the heavy standard equipment, he could see an economic future to railroads only if something radical was introduced to stop the trend.

The principle that Goicoechea used provided a simple method of guiding train wheels to eliminate the weight needed as a precaution against derailment. This was not a new idea by any means. The principle has been applied to miniature railroads used in amusement parks.

*Development*

However, the main difficulty to overcome was to utilize the principle and yet to provide comfort enjoyed by passengers on standard trains today.

RICHARD CHORONZY

Dick Choronzy was born in Chicago, June 15, 1929. Too young to have been in the service, this is the farthest Dick has been away from home. One of the Navy Pier ILLINI, he was editor of the Technograph at that school prior to coming to Urbana.

Majoring in Mechanical Engineering research, he hopes to continue for graduate work upon graduating in 1951. Dick is a member of the A.S.M.E., and Sigma Phi Delta, one of the two social engineering fraternities on the campus.

Goecoechea finally solved the problem by joining a number of short cars in such a manner that they would ride as one unit.

After considerable study of the principles involved, Goicoechea contacted Mr. Jose Luis de Oriol, an outstanding Spanish industrialist. There was immediate realization on the part of Mr. Oriol that the new idea was intensely important and outmoded the older ideas on railway design. Under the leadership of Oriol, *Patents Talgo S A,* was incorporated.

Several two-wheeled short units, built by Spanish manufacturers, were employed in a trial run in which the motive power used was a diesel-powered truck loaned by the Spanish National Network of Railways. The test proved successful, albeit the short units were improperly designed and the motive power was an unsuitable substitute.

The speed attained was well over 80 *mph,* and the performance around the curves was remarkable. It was decided to go ahead with plans and the services of James J. P. Mac-Veigh were secured to head the engineering department and to organize the complex layout of engineering problems that had to be carefully analyzed and assembled.

It was realized that to introduce this new line of railroad equipment, the corporation would have to team up with manufacturers experienced in this field. In december, 1944, Goicoechea and Mac-Veigh came to New York to present their plans to the car builders of this country. The American Car and Foundry Company showed great interest in the matter from the very beginning.

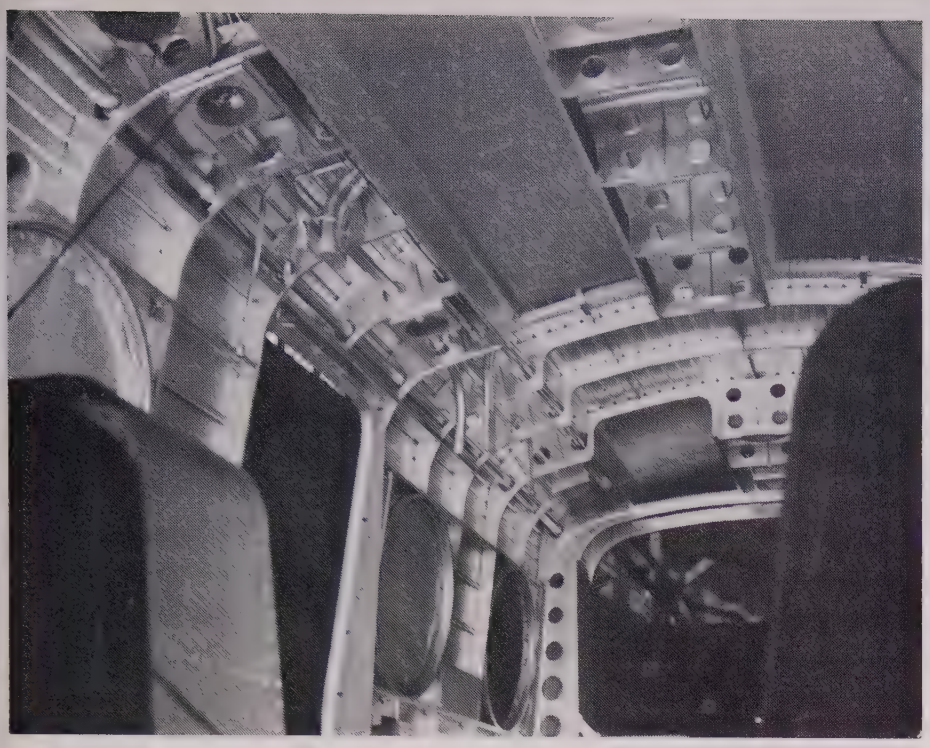
A contract was signed between the two companies on December 8, 1945, calling for the development of the ACF-Talgo. The term *Talgo* is derived from three Spanish words, *tren* (train), *articulado* (jointed), *ligero* (light), and the names of the inventor, Goicoechea, and the financier, Oriol.

Work was started in January, 1946, and just recently, the ACF-Talgo was completed; it was the first of its kind ever to be built.

The ACF-Talgo represents entirely different concepts in construction of railroad passenger cars. Floors are two feet, nine inches lower, the weight has been reduced 75 per cent, and the overall height is four feet lower than other streamlined equipment on railroads today. The center of gravity is two feet lower. Already, a Talgo has been shipped to Spain, and the tests have been successful in that country.

The American experimental and dem-

The new ACF-Talgo is an ingenious departure from present-day railroad train construction. (Photo courtesy of American Car and Foundry Company)



A view of the interior, prior to air-conditioning installation, shows the framing details of the ACF-Talgo equipment unit. (Photo courtesy of American Car and Foundry Company)

onstration Talgo consists of only a diesel-electric locomotive, a baggage unit and a coach of five units, one of them being for equipment and another serving as an observation lounge. The train is 168 feet long at this time. Eventually, the length is to be tripled for general railroad use.

In order to understand the principles of the Talgo, certain concepts in fast train operation must be understood. In most instances, speeds are restricted by curves. Time and time again, streamliners have attained speeds of 80 *mph,* only to have the brakes applied for a curve. There is also a large centrifugal force to overcome, again restricting top speed on curves.

In addition, the flange on present-day railroad wheels digs into the inside of the outer head of the rail, and the downward rub or friction of the flange creates a force which tends to lift the car and derail it. All of these difficulties have been time-consumers, with the result that the full use of the high-quality railroad tracks has not been attained.

The radically different Talgo overcomes these difficulties on the basis of its design. It is conservatively estimated that 25 per cent of travel time (on most runs) can be saved through the use of this new train.

*Guided Wheels*

A conventional train wheel travels in the vertical plane of the rail. The friction is very small when the wheels contine on a straight horizontal rail. However, the friction becomes very great when the wheels begin to travel on a curve. It is quite obvious that the force created against the rail cannot move the latter, therefore, the wheel tries to leap the rail.

The Talgo does away with the positive angle of attack on the outer rail as the wheels are led around the curve through the use of a three-point geometry of the underframe—like a trailer behind a truck-tractor. Each Talgo unit is supported in four places: on each of the two wheels at the rear of the unit and on two horizontal support members which fit into corresponding brackets on the rear of the unit ahead, about two feet above the floor.

As each unit goes into a curve, it has already been turned slightly by the preceding unit, which is already in the curve. The leading edge of the flange is pulled away from the outside rail, resulting in a negative angle of approach, with the derailing factor eliminated.

In standard railway passenger cars in operation today, the car is supported to clear the wheels under all curvature conditions. With the weight of the car centered above the point where its weight is transferred to the truck, a car will tend to lean outward on a curve just like an automobile. This is compensated for by super-elevation, which consists of making the outside rail of a curve higher than the inside.

This solves the problem for high speeds, but when other standard equipment is used on those same rails, such as a slow freight train, the pressure on the inside rail creates a noticeable drag on the locomotive.

The design of the Talgo solves this problem also. Instead of a truck under each end of the car with the axles extending from wheel to wheel, the car is suspended on two stub axles, one on each side of the car, so that the passengers actually walk *between* the wheels.

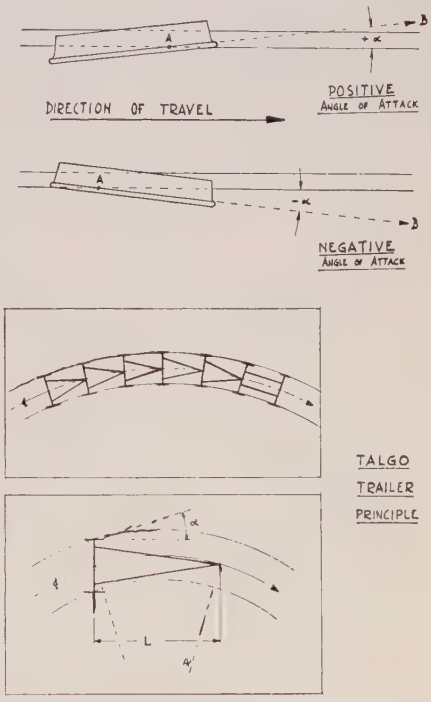
*Car Construction*

There is considerably less use of materials, especially in the undercarriage; and as a result, aluminum alloys have been used to a large extent in the construction of the Talgo. The weight of five units, which is practically the same capacity as that of a standard car, is less than one-fourth of the latter. Wind resistance is cut down because of the lower height of the Talgo, since there is a reduction in cross-section area.

In the underframe, a "U" shaped center sill, of aluminum alloy forms the backbone of the unit. Cross-bearers, floor beams and floor stringers are "Z" sections while the side sill is actually two parallel extrusions.

An unusual departure in railway car construction is the use of combination side posts and carlines to form the unit's cross-section. There is no break at the eaves as the hydraulically-pressed sections form one piece from side sill to the center line of the room. The chan-

(Continued on Page 26)




The first two diagrams show the negative and positive angles of approach; the third, the use of the trailer principle as the Talgo rounds a curve. (Photo courtesy of American Car and Foundry Company)

# The Engineering Urge...

***By W. M. Wilson***

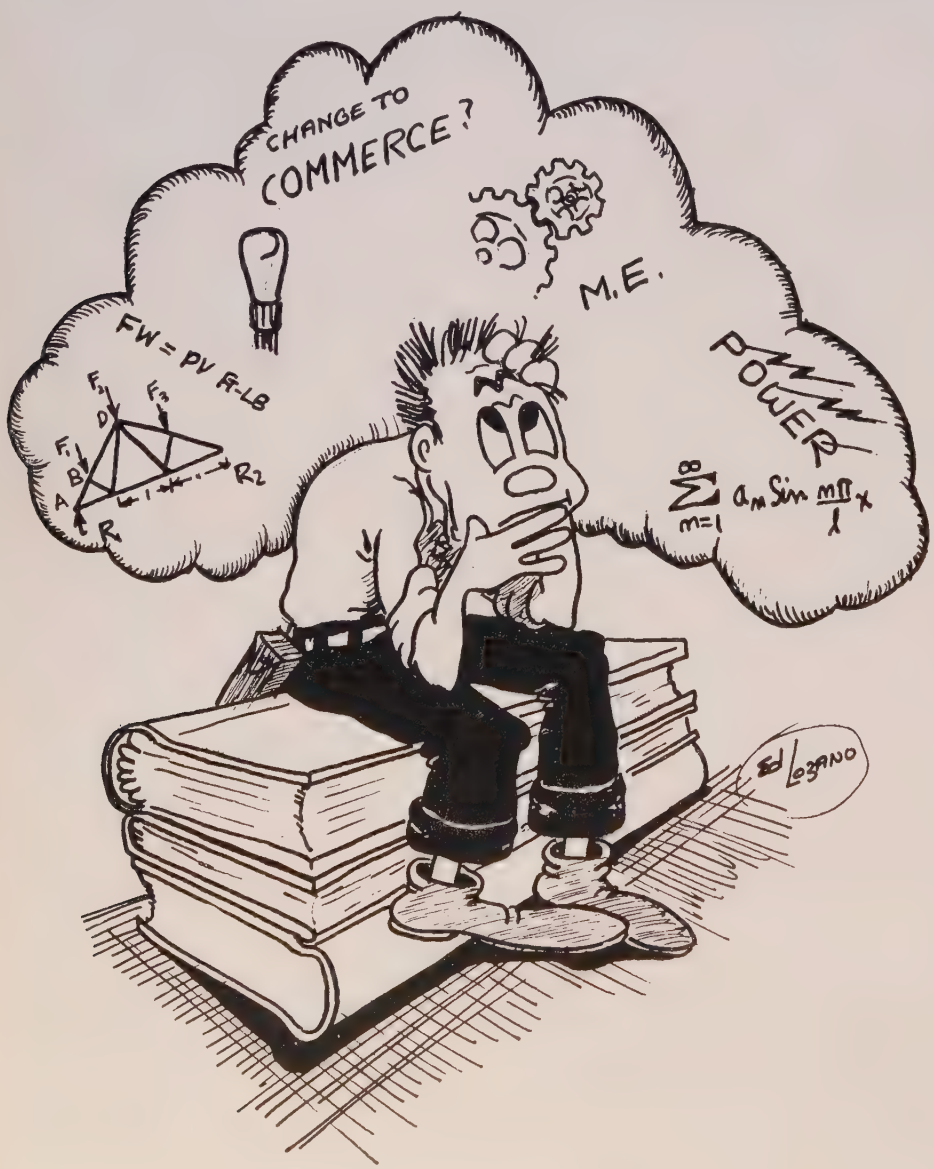
Research Professor of Structural Engineering, Emeritus

Statistics show that approximately 85% of the alumni of the College of Engineering of the University of Illinois are engaged in some line of engineering work. What does this mean?

Does it mean that most of our engineering students selected engineering because they were endowed by nature to be engineers? Or does it mean that our alumni have persisted in engineering work, in spite of inclinations and native ability along other lines, simply because they took an engineering course?

Next to selecting good morals, selecting a proper occupation is the greatest decision in a young man's life. Some men look upon daylight as a time in which to earn money in order to enjoy competency in old age. Both are wrong. Daylight is a work time and youth is a time to accumulate; but for life to be satisfactory the work itself must be a pleasure. Eight hours of drudgery paid for two hours of pleasure is a bad bargain.

For every man there is some employment in which the labor itself is a pleasure. Every man owes it to himself to find that occupation as early in life as possible. This is an obligation that many a man overlooks. He does not realize that his selection of an occupation may determine whether he is to have 40 years of pleasant industry leading to abundance and success. Yet the choosing of a right or wrong occupation may mean just this.




*To Be or Not to Be*

A college course is selected at a time when a man is not in a position to make an intelligent choice. Statistics show that a very small proportion of our students follow the occupation of their fathers.

Engineering students come from farms; students in agriculture come from cities; sons of doctors study to be lawyers; and sons of lawyers study to be doctors. Consequently the student does not have a first-hand everyday acquaintanceship with his prospective profession at the time he selects his college course. He does not know the kind of ability required; he does not know the environment in which the work will be done; he knows nothing of the tedious hours of routine; nor does he know the remuneration which the average man in the profession receives.

**Your career and your first job are two of the most important decisions you'll ever make. Yet have you made a thorough investigation of your field and special type of work? Have you given the problem due consideration? Have you decided about research, sales, or production; or possibly personnel or public relations?**

**This article first appeared in the November, 1920 Technograph when Mr. Wilson was an associate professor. His suggestions are fully as valuable today as they were 29 years ago. Having information from the Career Conference still in mind, you should find Mr. Wilson's article especially helpful to make a wise decision.**

The city boy, lured by the high prices of produce, the independent simple life, and the open air, decides to be a farmer. Likewise the country boy, lured by high salaries, good clothes, absence of manual labor, and the opportunity for social pleasure, goes to the city.

If a boy is handy at fixing door bells, his parents and neighbors speak of him as a promising electrical engineer, not realizing the difference between an electrician and an engineer. Likewise a boy who plays with toy engines, and what boy does not, is destined to be a mechanical engineer. That is, the selections are based upon incidents and not upon fundamental principles.

*What Do You Want?*

In selecting an occupation two questions are fundamental: What do you want to get? What do you want to become?

Life is a long journey. The first step in a journey is to select a destination, decide where you want to go. Where

(Continued on Page 30)

*Been jumpy lately? Try . . .*

# ULTRASONICS FOR NERVES

**By Luther Peterson, E.E. '51**

*With the advance of a new science, Ultrasonics, many new problems heretofore never discussed or thought of have arisen. One of these problems is the effect that ultrasonics has upon nerve tissue. This article brings out the highlights of the problem, which is mainly the development of new equipment for testing these effects.*

Probably one of the newest fields of research in ultrasonics today is its effect on nerves. Many people have heard or seen pictures of objects being supported in mid-air only by this unseen and unheard high frequency sound, yet very few people have heard anything about it effects on nerve tissue.

Within the last year, Professor W. J. Fry of the Electrical Engineering Department has undertaken the study of ultrasonic irradition of nerves. It is still too early to draw any conclusions because of the broad scope of the program.

Because research in this field of ultrasonics is in its early stages of development, new equipment has to be developed as the problem advances. As a result, the research problem has been primarily that of instrumentation.

*Apparatus*

The set-up of the apparatus can be broken into five general groups. They are as follows: (1) sound tank and associated equipment, (2) sound projector driver, (3) observation equipment (used to detect the activity of the nerve tissue), (4) nerve stimulator and sound control circuits, and (5) the equipment to measure the sound intensity.

The sound tank, which uses water as the transmitting medium, encloses the sound field. The tank, which is also insulated to prevent reflections of the sound, contains the coordinate systems for locating and supporting the nerve holder and probe, the ultrasonic projector and the focusing mirror and control.

A piezoelectric crystal, contained in a housing to protect it from the water, comprises the sound projector. The sound is projected through a thin diaphgram which separates the crystal from the water; and since only the resonant frequency of the crystal produces the desired intensity, a different projector is used for each frequency.

The principle frequency range is from 700 *kc to* 1,000 *kc* with the crystal producing about 175 watts of power. To focus this sound a six-inch focal length aluminum parabolic mirror is used; it can be adjusted by two independent angular movements. In this respect it is seen that the sound is controlled somewhat like light.

Another and very important part of the tank is the coordinate system which supports the nerve holder; it also provides three rectangular motions and one rotational movement for moving the probe to obtain field distribution patterns. The probe itself consists of a small piezoelectric crystal and is constructed in such a way to make it very directional.

The next and probably the most important piece of apparatus is the nerve holder. Several holders have been used and all contain imbedded electrical stimulating and receiving electrodes. These holders are enclosed in a rigid envelope which also contains Ringer's solution surrounding the nerve. The electrical leads are brought out of the tank and

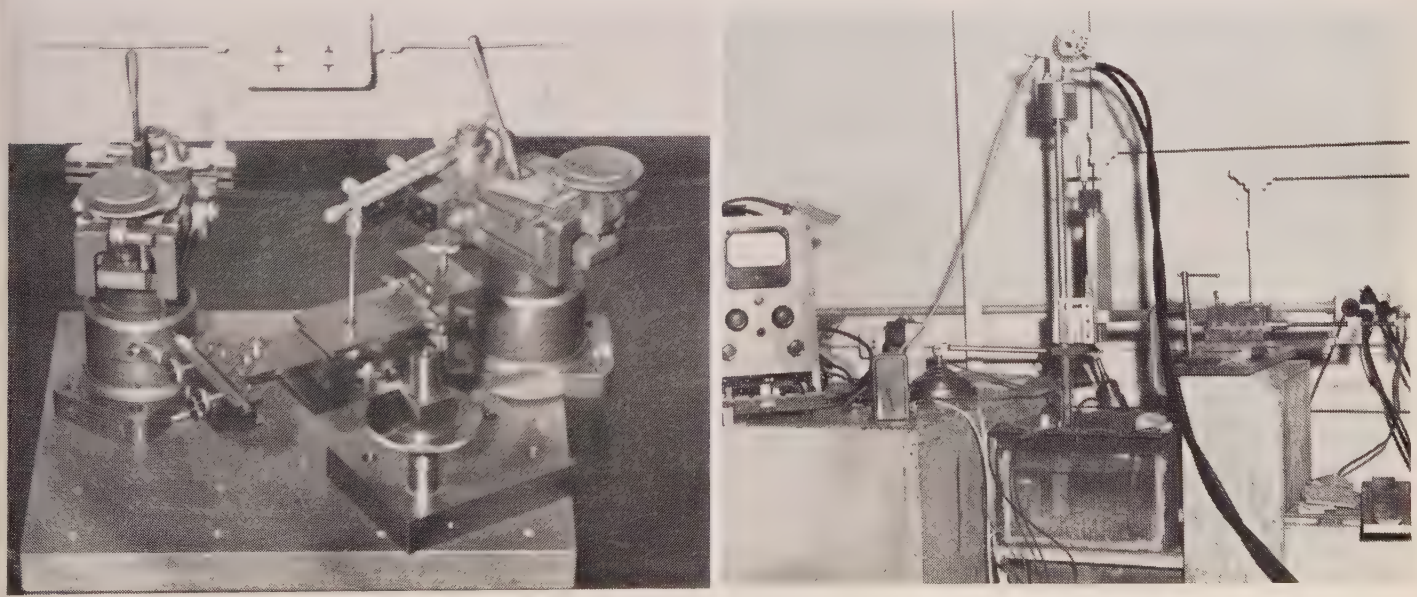
(Continued on Page 36)

Pete, a junior in Electrical Engineering, was a member of the Technograph staff at the Galesburg division before coming to the Urbana staff.

He was born on Jan. 6, 1927, in Moline, Ill., but has spent the greater part of his life in Chicago.

After leaving the Army he was undecided about attending school or going to work. His indecision about attending college was due to the fact that he thought the studies were too difficult. However, after he talked to several fellows who had attended school, he changed his mind and here he is.

LUTHER S. PETERSON



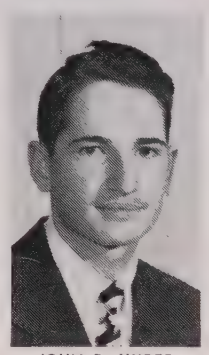
The micro-manipulators (left) aid in the dissection of nerve fibers used in the experiments. On the right is the water-filled sound tank and associated metering equipment. (Photo by Lou Davidson)

### No, They're Not Spots Before Your Eyes, They Are . . .

# SUNSPOTS

**By John Huber, Ag.E. '52**

*Have you ever wondered about the cause and appearance of spots on the sun in our solar system? Ever since Galileo first observed this phenomena, men have been puzzled and have proposed theories on the subject. The following gives a possible explanation of the cause and many interesting facts about these bewildering sunspots.*



JOHN R. HUBER

John transferred this year from the Galesburg division where he was on the Technograph staff and was a feature writer for The Galesburg Illini. He has a great interest in writing and hopes to apply it in his chosen field of engineering.

His main activities have been growing poultry on his home farm near Williamsfield, Ill., carpenter work, and being a 4-H member for the past 10 years.

He is a member of Phi Eta Sigma and A.S.A.E.

Celestial phenomena have fascinated men since the beginning of time. Sunspots, though one of the smaller features of our universe, have attracted their share of attention. In 1610 Galileo viewed the sunspots through his homemade telescope. He was probably the first man to give them much notice for even the largest sunspots are barely perceptible to the naked eye.

Heinrich Schwabe, a German apothecary, started in 1826 to make daily records of the number of spots visible on the sun. After 25 years of this routine his labors were recognized. He found that the number of spots fluctuated in about a 10-year cycle.

This information might have passed as inconsequential if it had not been for simultaneous records being made in other countries on the magnetic needle changes, the number of magnetic storms, and the frequency of the Aurora Borealis displays.

Comparison of these records revealed a startling fact; the magnitude of these recorded conditions fluctuated in almost perfect unison. This intriguing fact led observatories to keep a daily photographical record of the spottedness of the sun from 1858 to the present day.

This lengthy and scientific record revealed more important information. It showed that the sunspot cycle varied from 8 to 17 years in length; large spots usually lie in pairs with the members of the pair east and west of each other; the hydrogen vortices that surround the sunspots rotate in opposite directions in each pair as corresponding spots in each hemisphere rotate oppositely; and corresponding spots in each separate cycle rotate oppositely; and sunspots have strong magnetic fields. This information served as a basis for the theories that were advanced in an effort to explain the sunspot phenomenon.

A Norwegian meteorologist, Professor Bjerkes, put forth a theory in 1926 that tried to explain most of the main aspects of the sunspot cycle. He reasoned that all the spots in one hemisphere during a given cycle are part of a single tubular vortex which passes around the sun parallel to the sun's equator and just below the visible surface. The gases in this tube all rotate in one direction round and round its walls. Disturbances in the sun cause this tube to bend upward and break out into the open and form two oppositely rotating vortices.

This assumption agrees with the known fact that all westerly spots rotate in the same direction in one hemisphere and all easterly spots rotate in the opposite direction. As this upper tubular vortex travels toward the equator an inner or lower vortex is traveling from the equator toward the pole. This inner vortex is rotating in the opposite direction from the outer one so when it breaks out at higher latitudes the spots it produces have their rotation directions reversed from the direction of rotation of the first mentioned sunspots. The first vortex sinks at the equator and follows the path of the second vortex toward the pole and the process keeps repeating itself.

This theory agrees with facts but doesn't attempt to explain why the sunspots in the two hemispheres behave oppositely.

After several unsuccessful attempts to accurately predict sunspot activity, J. Halm advanced the hypothesis that each sunspot cycle was a fresh burst of activity and not related to any cycle of the past. Stewart added that sunspot cycles differed in magnitude but not in shape.

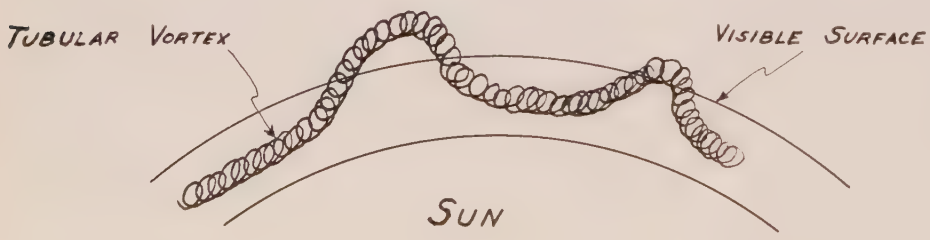
Sir John Herschel, an English astronomer, reasoned that the spots were the dark, solid body of the sun itself laid open to view. It was later proved that the sun has no dark, solid body so Herschel's idea was discarded.

Others likened the spots to cyclones and said that the bright flares that burst over the spots were electrical discharges between the magnetic fields of the spots. Professor Hale of Mount Wilson Observatory said that the spots appeared dark because of their relative coolness and this coolness was caused by the rapid expansion of gases spirally rising from the core of the spots.

The theories advanced, though some of them were highly reasonable, haven't been accepted as the final word by astronomers. Astronomers are scientists and scientists have an inborn passion for facts, thus they haven't paused in their search for more and more information about sunspots. Thanks to this ceaseless study we now have a vast, though not complete, story of absolute facts about this well known malady of the sun.

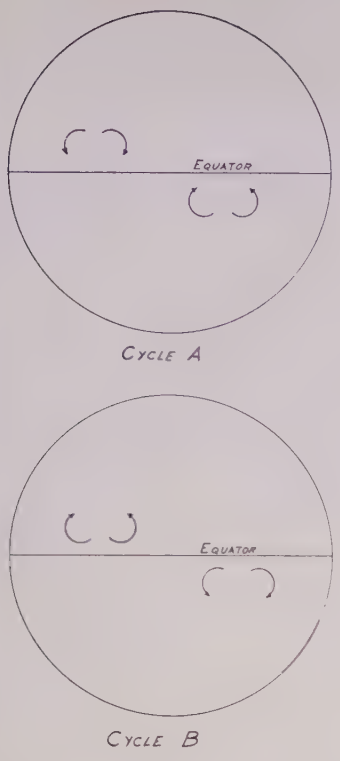
Present knowledge of the sunspots is as follows: A spot consists of a dark inner portion known as an umbra and a lighter surrounding area known as a penumbra. A penumbra may enclose several umbrae. A light ring may sometimes surround a large spot.

Sunspots range in size from 500 to 50,000 miles across. Sometimes they form in groups that blacken out several




BJERKES' THEORY

Bjerkes advanced the theory that sunspots are part of a tubular vortex that passes around the sun's equator.




Diagrams show the opposite behavior of sun spots on either side of the sun's equator.

billion square miles. These large spots may last two or three months while the small ones only exist a few days.

The spots appear dark because they are 1,000 to 1,500 degrees cooler than the surrounding gases. (This temperature difference was definitely proved by two main discoveries brought about by spectrum studies. The sunspot spectrum revealed lines due to titanium oxide which couldn't possibly exist in the intense heat of the surrounding surface of the sun. The sunspot spectrum closely resembles the spectrum of an electric arc while the sun's spectrum resembles that of an electric spark and it is a demonstrational fact that an electric spark is much hotter than an electric arc.) The magnetic field of sunspots has been measured as being 8,000 times the strength of the earth's magnetic field.

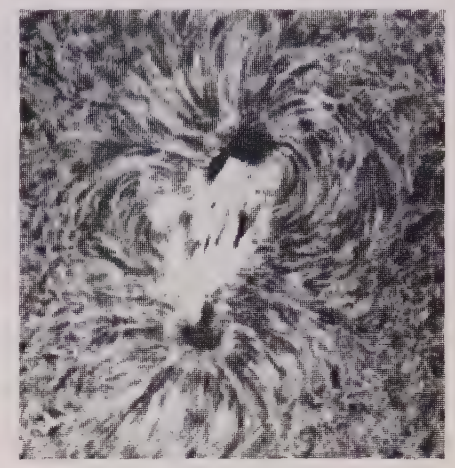
A sunspot cycle starts with the breaking out of small spots at points about 45 degrees from the poles of the sun. They migrate toward the equator and become the largest and most numerous when they reach points about 10 degrees north and 10 degrees south latitude. This is known as sunspot maximum. As they move still closer to the equator they slowly die out and a new cycle starts at the 45 degree latitudes. Spots very rarely occur nearer the equator than five degrees but one pair was observed that actually straddled the equator.

These atmospheric disturbances on the sun are undoubtedly caused by actions in the core of the sun, a place impossible to observe. This may make it impossible to ever fully explain the cause and nature of sunspots, but the limits of obtainable knowledge are boundless; there is still a chance of cracking the sunspots' closely kept secrets.

We, on this satellite, are most interested in how sunspots affect our environment. This knowledge is even more limited than that of the spots themselves because it is difficult to determine exactly what is caused by the spots and what is caused by other celestial disturbances.

Some biologists believe that sunspot activity has a direct influence on growth. They back this assumption by pointing out the relative size of tree rings as varying directly as the cycles of the sunspots.

Electrical disturbances caused by the sunspots are thought of in our elec-



A high magnification shows two of the sunspot vortices. (Photo courtesy of Scientific American)

tronic age as being their most important effect. Bright flares often flash out over spots and as they do short wave radio transmission is blacked out.

As electrical discharges are emitted from the sunspots and bombard our upper atmosphere, the well known Aurora Borealis displays are produced. These beautiful displays are an awe-inspiring tribute to the power of the mysterious sunspots that are 93,000,000 miles away.

A telescopic photograph shows a group of sunspots under a high magnification. (Photo courtesy of Scientific American)

## World's Lightest Solid

A solid that will float on a gas, Freon 113, has been developed by Westinghouse. It is a foamed phenolic resin that weighs only 0.6 pounds per cubic foot.

The chief developer of this amazing substance, Robert Sterling, prepares it by mixing a dark liquid resin. The resin is then baked for a few minutes at 180° *C*, and the result is a hundredfold increase in volume.

This foamed resin, which is only one-fifteenth the weight of fluffy meringue, promises to have widespread applications. The most promising of these applications seems to be in the insulating field. Its extreme porosity and low density make it a natural for this field. Also it can be shipped as a liquid and expanded on site, thus saving tremendously on shipping space. It is also very resistant to moisture absorption.

Its other applications seem to be limited only by the imagination.

# *In This Corner...* NAVY PIER

## DEAN F. W. TREZISE

By Clarence Niebow, M.E. '51

As we pass the offices of the College of Engineering Sciences here at the Pier, we cannot help noticing a new personality. He is Prof. Fredrick W. Trezise, associate dean of Engineering Sciences.

Professor Trezise came to the Pier last June from Galesburg, after its closing. He succeeded Prof. R. P. Hoelscher, who had returned to Urbana to head the General Engineering Drawing Department.

Professor Trezise's career in engineering has taken him to many parts of the globe, from as far south as Mexico to the northern parts of Canada. His career as an engineer began at Michigan State University, where he received his B.S. degree in civil engineering. He completed his graduate work at the University of Wisconsin where he majored in hydraulics; and after World War I he attended the University of Bonne, Germany. While attending these institutions, Mr. Trezise developed an interest in education, which brought him to Lawrence College where he served on the faculty for 15 years. While serving on the faculty, he was called from time to time to supervise the construction of a number of building projects.

While at Lawrence College, Mr. Trezise made exhausted investigations of the mineral claims in the Sierra Madre Mountains, the Black Hills, and the Great Bear Lake region.

The engineering project in which Mr. Trezise is most commonly associated with is the TVA. In 1936 he was called upon to set up plans for the construction of various dams in the Tennessee River basin. When the war broke out, the TVA was called upon to produce more power in order to supply our war machine. Professor Trezise was then offered the position of personnel officer for all management services at Knoxville, Tennessee. In order to meet these new demands more labor was needed. Because of the emergency the employment rose to 42,000 and the agency was geared to "run around the clock."

While working with the TVA, Professor Trezise assisted in the purchase of the "Kingston Demolition Range," which later was to be known as the "Atomic City," Oak Ridge, Tennessee. Before the Army took over this tract of land, it contained the most delapidated farms in the South. It was then developed into the fourth largest city in Tennessee. This task required tremendous power that only the TVA could furnish.

As personnel officer Mr. Trezise was able to discover certain qualities that a good engineer must possess in order to make a success in his field.

Here at the Pier he expects to create a compulsory orientation course for engineers. This orientation course will help the engineering student get better acquainted with his chosen field and will give him a better perspective on the future.

DEAN F. W. TREZISE


NAVY PIER STAFF

Bob King ..... *Editor*
Ronald Sak ..... *Asst. Editor*
Clarence Niebow ..... *Associate*
Mr. Ogden Livermore ..... *Sponsor*


## Engineering Societies

By Ronald Sak . . . Aero. '52

### A.S.C.E.

This society holds its regular monthly meeting on Tuesdays at 3:00 p. m.

The society's annual smoker was held on October 21. A large number of members were present and all had a good time. The boys talked camp, basketball, and everything but "school."

The annual scholarship is being offered this year; also the Sponsor's prize will be given to the man with the highest grade. These prizes will be awarded next June.

### A.I.E.E.

On October 20 the student chapter of the American Institute of Electrical Engineers held an election of officers for the 1949 fall semester. The results are as follows:

Chairman ..... Joe Knauff
Vice chairman ..... Dale Hileman
Eng. Council Rep. Richard Klensch
Secretary ..... Marshall Uhl
Treasurer ..... Robert Andrews

Dale Hileman presided over the meeting and election. Program, publicity, and membership committees were discussed and appointed.

Among the semester plans of the AIEE is a trip to one of Chicago's television stations where the electrical engineers will have an opportunity to inspect its technical side. They will also have a chance to talk with T-V engineers and producers.

Plans are also being made to bring Bell Telephone's technical exhibit and demonstrations to the Pier. This will be of interest, no doubt, to all engineering students.

The electricals intend to sponsor a

(Continued on Page 42)

# *Introducing . . .*

***By Jack Sitzler, Cer.E. '52***
***and John Huber, Ag.E. '52***

### PROF. A. W. ALLEN

Contrary to popular belief, freshman lectures do have a purpose.

Professor Allen became interested in ceramics by the influence of a first year lecture he attended while working for his B.S. at the Missouri School of Mines and Metallurgy. From there he went to Virginia Polytechnic Institute to receive his M.S. in 1942.

**PROF. A. W. ALLEN**

From 1942 to 1943 he worked as a research engineer at the Harbison-Walker Refractories Company in Pittsburgh. As a result of his continued interest in this field of ceramics he was well qualified for the position of editor of the *Refractories Division of Ceramic Abstracts*. 1948-49.

In 1943 he enlisted in the aviation cadets and was commissioned as a navigator. He then taught navigation until transferred to Chanute Field where he became a rated meteorologist.

After he was discharged in 1945 Mr. Allen came to the University of Illinois to work on the Air Force project concerning the use of ceramic products for coating the internal combustion chamber of jet engines. While working on this project he accepted a position on the teaching staff here and in 1946 he started teaching. He received his assistant professorship the same year. He is now an associate professor in the Ceramic Engineering Department, and is now teaching an introductory course, Pyrometry, Microscopy, and Refractories.

Along with his teaching, Professor Allen is very active in faculty and student organizations. He is a member of the Engineering College policy and development committee and also the time table committee.

Professor Allen is a member of ACS, Sigma Pi, Tau Beta Pi, Sigma Xi, Keramos, American Mineralogical Society, Association for the Advancement of Science, and the American Society for Testing Materials. In the ASTM he is a member of committee C-8 on Refractory Materials.

### KEITH GOODWIN

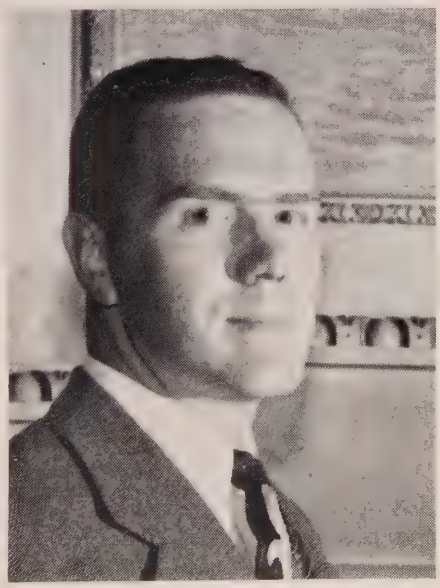
So often it is said that an engineer must learn to work with people as well as with things to be truly successful. If this bit of advice is true, Keith Goodwin shouldn't have any trouble. He has been working with over 1,000 students as chairman of the Block I stunts at football games.

Keith will graduate next June as an electrical engineer with power option. He hopes to get a job then with a public utility company in the field of applications. His interest in electricity began in his grade school days and has increased with knowledge.

He is a member of AIEE-IRE and was chairman of the student branch last year. In 1948 Keith was on the Engineering Council and was co-chairman of St. Pat's Ball. Block I has had his services for three years. He is a member of Phi Eta Sigma, Eta Kappa Nu, Tau Beta Pi, and has been awarded a scholarship key.

Keith spent 13 months in the Navy as a printer. Photography is his main hobby. He was raised in Springfield, Illinois, and has a brother who is an electrical engineer working for Goodrich Rubber Company.

The first big step of his career will be made next year—he's getting married.



**KEITH GOODWIN**

### PROF. NEWLIN D. MORGAN

A successful civil engineer signed the name of Newlin D. Morgan to a University of Illinois teaching contract by lamplight some 26 years ago in the mountains of Colorado. It was in September of 1924 that he started here as an associate.

His record prior to that time showed the development of his interests and abilities. He was valedictorian of the North Denver High School class of '06 and attended the University of Colorado on scholarships. It was there that he received his B.S. degree in 1910.

**PROF. N. D. MORGAN**

Professor Morgan's first job after graduation was with the American Bridge Company in Chicago. He helped them organize their branch office in Gary in 1912. It was while working with this company that he became interested in designing.

This interest was developed during the next few years while working for the Chicago, Milwaukee and St. Paul Railroad designing their buildings. This

(Continued on Page 24)

# The Engineering Honoraries and Societies

*By Dwight Beard, E.E. '51*

### A.I.E.E.-I.R.E. and A.S.M.E.

A display of cooperation and coordination that has possibilities for bringing some outstanding programs to student engineers was evidenced recently by the American Society of Mechanical Engineers and the Institute of Radio Engineers—American Institute of Electrical Engineers. These organizations sponsored a joint meeting October 28.

Bernard G. Hatch of the General Electric Company spoke on the latest developments of gas turbines. He explained the turbines and their applications in relation to power plants and locomotives. Interesting films, related to the subject, were also shown.

This method of organizations combining to present programs of general interest gives the "wheels" excellent experience in working with other groups.

### A.S.M.E.

ASME officers elected this semester include Al Helene, James Eberhardt, and Wolfgang Junkel. Their respective positions are secretary, assistant treasurer, and junior representative to the Engineering Council.

A rousing discussion concerning the methods of electing officers was terminated by a motion that the executive committee study the question with the purpose of proposing amendments to the constitution.

November 2, Dean H. H. Jordan spoke on "Placement Procedures and Prospects." The dean outlined the placement structure employed by the University which emphasizes decentralization. The University Placement Service is broken down into functions of the college offices, which in turn are divided into departmental functions. In the case of the Mechanical Engineering Department, placement services are handled through the office of the Dean by Professor Ryan. He contacts the students and handles personalized services for the prospective employers.

Of the personal services offered, the character rating sheet is of prime importance to the student. The Mechanical Engineering Department has made up a character sheet on which are evaluated such qualities as personality, industry, and ability to get along with people. These are evaluated by each student's instructors. The results of several ratings are compiled and distributed to interviewers to aid them in making employment decisions.

Another fact that Dean Jordan emphasized was the importance of keeping in contact with the school after graduation. As an illustration, he stated that he could recommend jobs that pay from $280 to $800 per month to the qualified engineers, if he only knew of those in need.

Following the talks by Dean Jordan and Professor Ryan, a discussion period was held to clear up questions which had not been answered. Dean Pierce was also present and helped to answer questions.

### A.F.S.

Charles Drury chose a very interesting and pertinent subject to bring before the foundrymen's club at their November meeting held in the M. E. building. He spoke on the differences between classroom instruction and foundry work as it is performed in industry. He also pointed out the difficulties one encounters in making the change from school to work.

A recent graduate of the University, Chuck is now employed by General Motors in Danville and his experiences in making the change from student to worker are still fresh in his mind.

Membership in the AFS is open to all students interested in foundry work. It is a branch of the national American Foundry Society.

### PI TAU SIGMA

Pi Tau Sigma, the national M. E. honorary, held its fall pledging smoker on November 8 in the faculty lounge of the Illini Union. Prof. D. S. Clark of Purdue, who is national secretary, was scheduled to give a talk, but as he was unable to attend, Henry Funckes of the local chapter gave his talk in his stead.

Some remarks were made by Prof. Norman Parker, head of the Mechanical Engineering Department; and the history of Pi Tau Sigma was related for the benefit of the new initiates by Boubene Jaremis, president of this chapter.

Refreshments were then served to the assembly.

### MU SAN

Mu San, municipal and sanitary engineering honorary fraternity, held its second meeting of the current semester on October 26.

The primary purpose of the meeting was the social mingling of old and new prospective members. The program consisted of slide pictures and a lecture given by one of the members, Ray Plummer, on water supply methods for the island of St. Croix in the West Indies.

The date for the formal initiation was set for November 9. Plans were also made for a field inspection trip to the sanitary and water supply districts of Springfield on December 3.

### M.I.S.

The MIS was indeed fortunate to secure Dr. Maurice D. Cooper to speak at their meeting November 9. Mr. Cooper was really well qualified to talk on "The Coal Industry and the Graduate Mining Engineer."

Besides having 25 years of experience in mining, he is chairman of the AIME committee on student relations. Moreover, Dr. Cooper is director of vocational training for the National Coal Association.

The short business session at this meeting included an outline and a discussion of the Career Conference, December 5, 6, 7, and 8.

## E. E. Senior Inspection Trip

The senior inspection trip which was dropped during the war was again revived through the efforts of the AIEE-IRE. The interest shown in the trip this year will undoubtedly warrant a required trip in years to come. It seems to be a well proven fact that the knowledge gained on such a trip easily outweighs expenses and inconvenience involved.

Three days, November 9, 10, and 11, were taken for the trip this year. Approximately 200 students from the electronic and power options went on the trip. This number was split up into five groups in order to facilitate guide service through the plants. Individual itineraries were set up for each bus so as

(Continued on Page 34)

By Dean Felton, C.E. '51 and Bob Lawrence, M.E. '51

*Words of Wisdom*

From Professor Alexander of our Chemistry Department we quote the following words which we feel can relate to many of our subjects: "Teaching Organic Chemistry is like pouring $H_2O$ into a sieve. The only hope is that it will run out slowly enough to last through each hour exam."

* * *

FLUSH THE BONEYARD

* * *

*Woman Suffrage*

We received word that Tau Beta Pi has again been in the throes of allowing women to become full-fledged members of the organization.

According to the present constitution, women are not given full membership, but outstanding women in the field of engineering may be awarded the Woman's Badge. This is purely honorary and does not award full membership. In the past 25 years, 96 women have been so honored. Of these, 95 have been awarded for honors in undergraduate work and one woman has been honored for her attainments in the field of electrical engineering.

At latest reports the men have not relented but the women are still trying to break into the ranks of the elite engineering honorary.

* * *

FLUSH THE BONEYARD

* * *

*University Fire Fighters*

There is one building on our engineering campus that appears quite independent. It is the fire department building, located directly behind Civil Engineering Hall. Although this building shows very little activity, compared to the hustling crowd that pours in and out of other buildings, it plays a responsible role in the maintenance of such a large University as our own.

Considering its relative responsibilities, the University of Illinois fire department is one of the best equipped and most efficient fire departments in the state.

Heading the fire department personnel is the fire chief, F. S. Stateler, who is in charge of the fire prevention program. His duties require him to inspect all buildings on the campus to determine the number of people they may safely accommodate.

He also determines any violations of the building code. These violations may include such items as improper construction, improperly placed fire doors, and inadequate exit or stairway space.

The remainder of the personnel is divided into two platoons, each consisting of 11 men and working on a 24-hour shift. The captain and first lieutenant are in charge of one platoon, while the assistant chief and second lieutenant are in charge of the second platoon. The nine remaining men of each platoon are divided into two companies. The engine company handles all first floor alarms, while the ladder company handles alarms of two stories or greater.

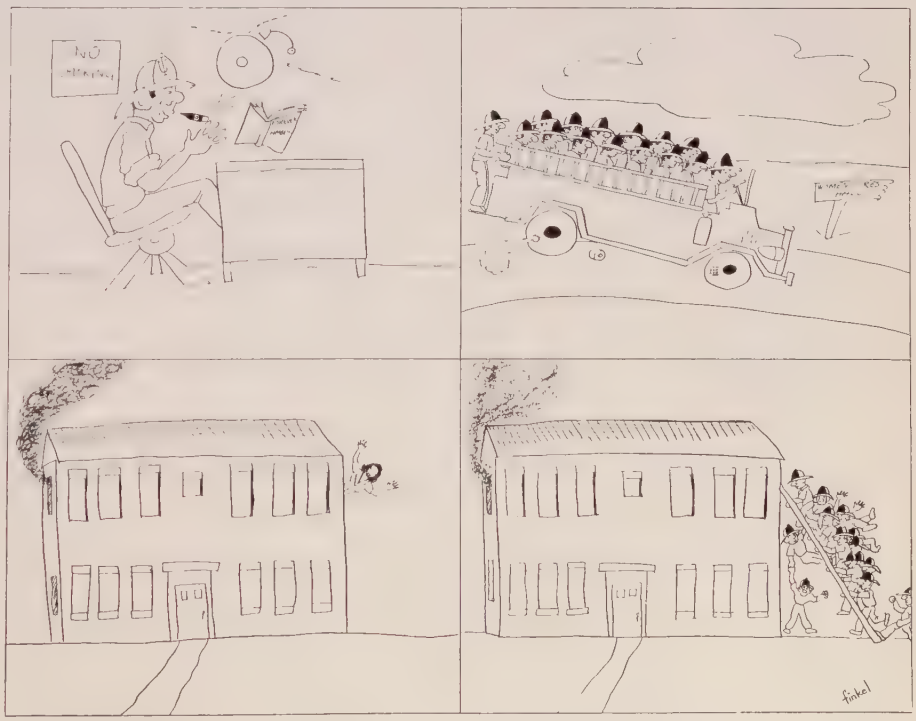
Everyone in the fire department must drill once a week to be constantly familiar with their equipment and its use. They must also have a knowledge of fire fighting procedures.

Their academic training covers nine different subjects. They are: (1) minor fire extinguisher practice and use; (2) ladders; (3) hoses; (4) salvage and overhaul; (5) water pressure and fire stream; (6) fire apparatus (rolling stock only); (7) ventilation; (8) rescue work; and (9) inspection.

The equipment of the University fire department is rated very highly. Its biggest fire truck is known as a "Quin" among firemen because it carries five types of equipment which include a 65-foot aerial ladder, a booster tank, hose, a pump capable of delivering 1,200 gallons per minute, and a rigid ladder assemblage consisting of seven ladders ranging from 16 to 45 feet. Another truck on hand is known as a "Quad;" it carries a 750 *gpm* pump, a booster tank, hose, and a rigid ladder. The remaining equipment includes a hose wagon, an emergency pick-up truck, life nets, life lines, a deluge pump and a high-pressure pump.

The fire alarm control room consists

(Continued on Page 34)



RAY L. HAUSER
Editor

•

CONNIE MINNICH
Associate Editor

the Illinois Technograph

# Peanuts for Students . . .

There are approximately 19,500 students, 3,054 faculty, and 2,592 nonacademic personnel at the University of Illinois. Each group has its various organizations. And each group pulls strings, plays politics, and in general proceeds independently and without consideration of the others.

An example is the virtual monopoly enjoyed (and I do mean enjoyed) by the Civil Service Employees Council, the official organization of non-academic personnel on campus. They receive the profits from 39 candy, Coca Cola, and peanut dispensers placed in campus buildings. But these profits aren't peanuts! Between January 1 and November 15, 1949, the net profit from these machines was about $2,000. That's not bad — but it isn't right!

What does the CSEC do with the profits? Besides maintaining a running balance of about $2,300, they throw a jamboree and a picnic each year.

Meanwhile, many student organizations must perform their educational and University-promoting functions without adequate finances. Practically all student organizations, and particularly our engineering societies, are supported only by dues from the members.

Last spring the Commerce Council, badly in need of operating funds, petitioned for installation and control of vending machines in David Kinley Hall. Their petition was approved by the Committee on Student Affairs and was referred to President Stoddard for authorization.

Despite approval by CSA, its chairman, Prof. Harry J. Fuller, and Dean Fred H. Turner then sent Stoddard a letter asking for a decision and suggesting that student groups not be authorized to control canteens. The reason? The CSEC has no other method to finance their welfare program; students may promote dances and other activities to raise money.

However, instead of buying flowers for the sick and the dead (as Dean Turner has said) profits have been used almost exclusively for entertainment. In fact the Statement of Belief and Intention, the policy of which the CSEC obtained authorization, has at the top of a list of example expenditures, "group, departmental or campus-wide parties, picnics, or other social events." Apparently Dean Turner didn't know this.

Objection to the other point? One needs only to ask Dean Hampton about the profits of recent student dances. Maybe Turner doesn't know this either!

Maybe Turner would prefer to be dean *for* nonacademic personnel rather than dean *for* students!

Yet there is a definite need for some kind of unifying activity for the nonacademic personnel.

Last May the *Technograph* sent a letter to Stoddard asking that the position of 19,000 students be considered along with that of Dean Turner and Professor Fuller. At the time of this writing, Stoddard has not made a decision. However, the provost, Coleman R. Griffith, has proposed a plan involving a joint student-faculty-nonacademic board to apportion profits from vending machines.

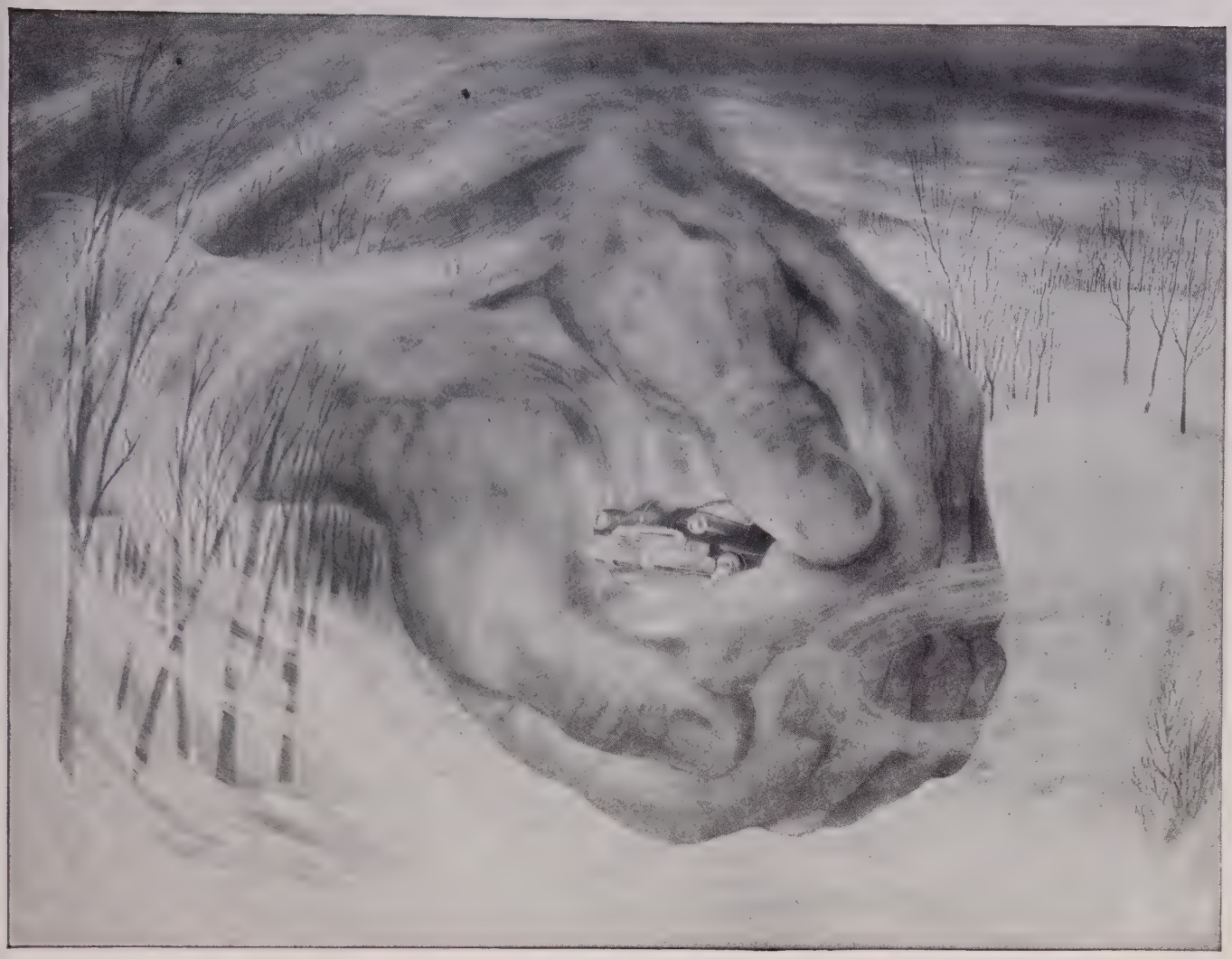
*The Illinois Technograph* approves this proposal if the proposed board will have proportional representation and if profits are distributed fairly.

Those organizations doing the most unselfish and constructive work should be the recipients of the students' share. Most needy and most worthy are the college councils that made possible the First Annual Career Conference. Improvement of the University is their main emphasis; student benefit is secondary.

Were it not for action by members of the Engineering Council, last spring's Engineering Convocation and Effective Instructor award, the Dad's Day tours, the Career Conference, and the forthcoming engineering open house, I SEE, would not be realities. And these are all definite services to the University.

We students may be paying for peanuts, AND THAT'S ALL WE'RE GETTING!

—R. L. H.



# *In safe hands . . . even at 60 below!*

DO YOU REMEMBER when winter meant storing the family car till spring? Not so many years ago, a car owner's fear of an ice-shattered motor was a dread reality . . . if he *didn't* drain his radiator and store his car once cold weather hit!

What was needed—acutely—was an automobile anti-freeze that would prove always *dependable* yet *economical.* One that would hold up under any operating temperature. That wouldn't foam and boil away. That would resist rust and corrosion to the *nth* degree.

That's where Union Carbide *research* entered the picture. The result? "Prestone" anti-freeze. Since then this product —the first all-winter anti-freeze—has assured millions upon millions of motorists of ever-improved driving performance, with assured safety . . . throughout the bitterest weather.

This is but one example of the way the people of Union Carbide are helping to better our daily living. And UCC stands ready to help solve other problems . . . wherever better materials and processes are needed.

**FREE:** *If you would like to know more about many of the things you use every day, send for the illustrated booklet, "Products and Processes." It tells how science and industry use UCC's Alloys, Chemicals, Carbons, Gases and Plastics. Write for free Booklet I.*

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# I SEE

## Illinois Student Engineering Exhibit

presented by

**THE ENGINEERING COUNCIL**

Ray Hauser, chairman

SCHEDULE:

March 10, 1950
12 noon—Engineers excused from classes
2 p. m.—Engineering Parade (societies and honoraries participating)
3-10 p. m.—Engineering Exhibits open to the public

March 11, 1950
9 a. m.—Engineering Exhibits open
9 p. m.—St. Pat's Ball

To plan and present the I SEE will take a little time by a lot of engineers. Your help is needed to make it bigger and better than the prewar engineering shows.

If you want to participate in this great event, see your society or departmental chairman:

AFS—Chuck Waters, 6-1894
AIChE—Bob Gaudlitz, 7-5333
AIEE-IRE—Cliff Stettler, 7-1785
ASAE—Jere Castor, 7-3509
ASME—Vic Swenson, 5847
ASCE—Harry VonHuben, 6-1847
IAS—Cliff Felt, 22-4 Ct. C, PGU
IES—Val McClusky, 9540
ITE—Tom Fry, 8942
MIS—Jim Skarda, 6-1907
SAE—Bob Reynolds, 7-6264
SBACS—Jerry Schweitzer, 6-2586
Physics dept.—George Mader, 7-5112
Arch. E. dept.—Jim Wood, 4689

If you are interested in the central committees (promotion, program, parade, etc.) drop in at 213 C.E.H. These committees will be coordinating the activities of all the engineering societies and will be responsible for the success of I SEE.

***Here's your chance to join an activity that engineering industry will be watching***

# "Magnet Wire? I didn't even know ROEBLING made it!..

THIS VISIT to just one of the Roebling works has been an eye-opener. Everyone in my line knows Roebling wire rope, but I never heard that you stack up so big in electrical wires and cables."

☆ ☆ ☆

Many people are surprised to learn of the wide diversity of Roebling's line of wires and wire products. It is often news, too, that several different items in the Roebling line are used in one and the same field. In mines and quarries, for example, Roebling Wire Rope, Aggregate Screens and Portable Electrical Cable are all likely to be on the job together. Wherever there's industry, there are Roebling products that help bring highest efficiency and lowest service cost.

**WOVEN WIRE FABRIC.** Roebling weaves wire screens to meet every sort of industrial requirement. From large size Aggregate Screens to closely woven Filter Cloths, wires made of special steels and non-ferrous metals bring new measures of resistance to abrasion and corrosion.

**WIRE ROPE.** Roebling wire rope is made in a complete range of types and always affords a rope that's *right* for every application. For easy handling, smooth operation and long life on the job, Roebling Preformed "Blue Center" Wire Rope is unsurpassed.

**ELECTRICAL WIRE — CABLE — MAGNET WIRE.** With more than 60 standard types, Roebling's line of electrical wire and cable meets practically all transmission, distribution and service needs . . . The insulation of Roevar Magnet Wire is 10 to 40 times tougher than other types — first choice for high-speed winding.

**ROUND — FLAT — SHAPED WIRE.** Manufacturers adopt Roebling high carbon wire for its dependable uniformity which minimizes machine stoppages and rejects, and pulls down production costs.

☆ ☆ ☆

Whatever career you are studying for, when you get on the job you will find one or more types of Roebling products serving there, dependably and at low cost. John A. Roebling's Sons Co., Trenton 2, N. J.

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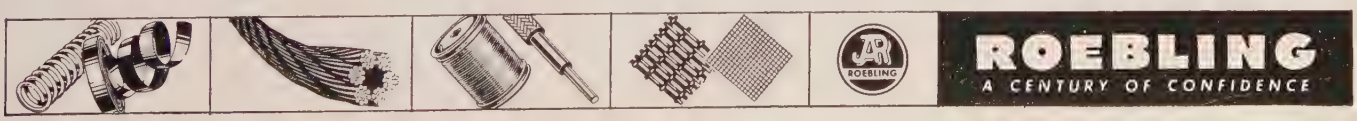


## Introducing . . .

( Continued from Page 17

work in designing deepened his growing interest in architecture.

The years from 1918 to 1923 found Professor Morgan back in Colorado. This time he was working for the U. S. Bureau of Public Roads. In this position he not only designed bridges but had the opportunity to supervise the actual construction in the field.

In 1923 the government made him district engineer for the Western states. It was during this period that he designed and supervised the construction of the highest two-hinge arch bridge in Colorado. He received his professional degree from Colorado University in 1925 on the basis of this achievement.

His first teaching experience came in 1923 when Professor Morgan took an emergency leave from his government work to fill a vacancy in the Colorado University staff.

Illinois managed to secure his services the next year, and he has been here ever since. He has been a senior professor and on the graduate faculty for the past 15 years. He received his M.S. here in 1928.

Professor Morgan is a member of the American Institute of Architects, the American Society of Engineering Education, the American Society of Civil Engineers, American Concrete Institute, American Association of University Professors, Tau Beta Pi, Sigma Xi, and other honorary societies.

He was associated with Hardy Cross in writing *Statically Indeterminate Structures,* published in 1926, and *Continuous Frames of Reinforced Concrete,* published in 1932. The latter book is a standard text in use in most of the universities and engineering offices throughout the country. It has been translated into Spanish and is widely used in South America.

While attending the University of Colorado, Professor Morgan was editor of their *Engineering Journal.*

Two of his children are professors, one is doing graduate work here at Illinois, and the fourth is in high school. Five members of the family are life members of the University Alumni association.

Professor Morgan now spends his summer months working on a cabin in the Medicine Bow National Forest of Wyoming with the help of his youngest son.

---

Guide: "This castle has stood for 600 years. Not a stone has been touched, nothing altered, nothing replaced."

Visitor: "Um, they must have the same landlord we have."

## New Developments . . .

(Continued from Page 2)

features will be incorporated into production engines as quickly as possible.

The engine is protected from icing conditions by internally heated, hollow parts at the nose; this includes inlet guide vanes, fairings, and forward frame struts.

## Versus Cancer

The atomic pile at Oak Ridge National Laboratories is supplying a potent power in the fight against cancer.

Needles of 55 per cent nickel, 45 per cent cobalt are made radioactive by exposure to the radiations of the atomic pile. The small, easily fabricated needles can then be inserted into diseased tissues.

It would require over a million volts for an X-ray tube to produce gamma rays equivalent to those of the nickel-cobalt wires. The gamma radiations are similar to those of radium but cover a narrower band of frequencies. The half life is five years.

Both the alloy needle and the process of making it radioactive are low in cost. It is utilized in cancer therapy in the same manner as gold needles containing radon gas. Moreover the radioactive needles are about half the size, and can be handled and located easily with electromagnetic tongs.

Dr. William Myers of Ohio State University was responsible for developing the use of this new needle; and the past year of clinical testing at OSU has seen the achievement of important gains in treating cancer.

## Diesel Switcher

Lima-Hamilton Corporation's new diesel switching locomotive is powered by the recently announced Hamilton 9″ by 12″ eight-cylinder, supercharged, four-cycle vertical diesel engine, which provides a full 1,000 brake horsepower for traction, utilizing the full capacity of the traction motors. The switcher, weighing 120 tons, has a maximum speed of 60 miles per hour.

The 1,000-horsepower switcher has a diesel engine radically different from those ordinarily used in switching locomotives. Additional features include its operation at *BMEP* (Brake Mean Effective Pressure) of 165 *psi,* with a firing pressure of 1,200 to 1,400 pounds. This is far beyond the pressure used in any other engine of this general type.

## Jet Power for Your Car

Thompson Products, Inc., Cleveland, Ohio, is now making a device that will provide that extra burst of power needed for motoring emergencies. It is a completely automatic auxiliary carburetor known as the Vitameter.

The flange of the Vitameter is inserted between an engine's manifold and its carburetor. When the manifold vacuum drops, due to the car's gas pedal signaling for added speed, a float chamber and a metering jet sprays Vitane, an alcohol-water, tetra-ethyl lead solution, into the throat of the main carburetor.

This "shot in the arm" causes the gasoline to burn more evenly thus eliminating "ping" and provides an extra burst of speed.

Thompson Products reports that 13 per cent Vitane in gasoline vapor is enough to raise a gasoline's octane rating 10 numbers. Enough Vitane for 150 to 200 miles costs 35 cents and the Vitameter itself costs $32 and up, depending on size.

---

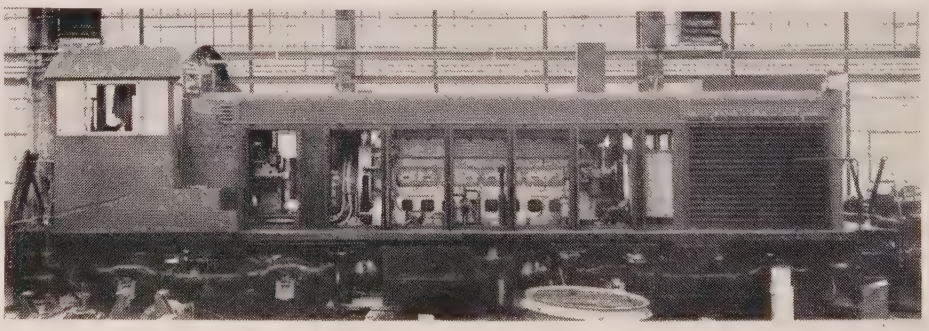
*"Mrs. Jones was outspoken at our club meeting today!"*

*"I can't believe it. Who outspoke her?"*

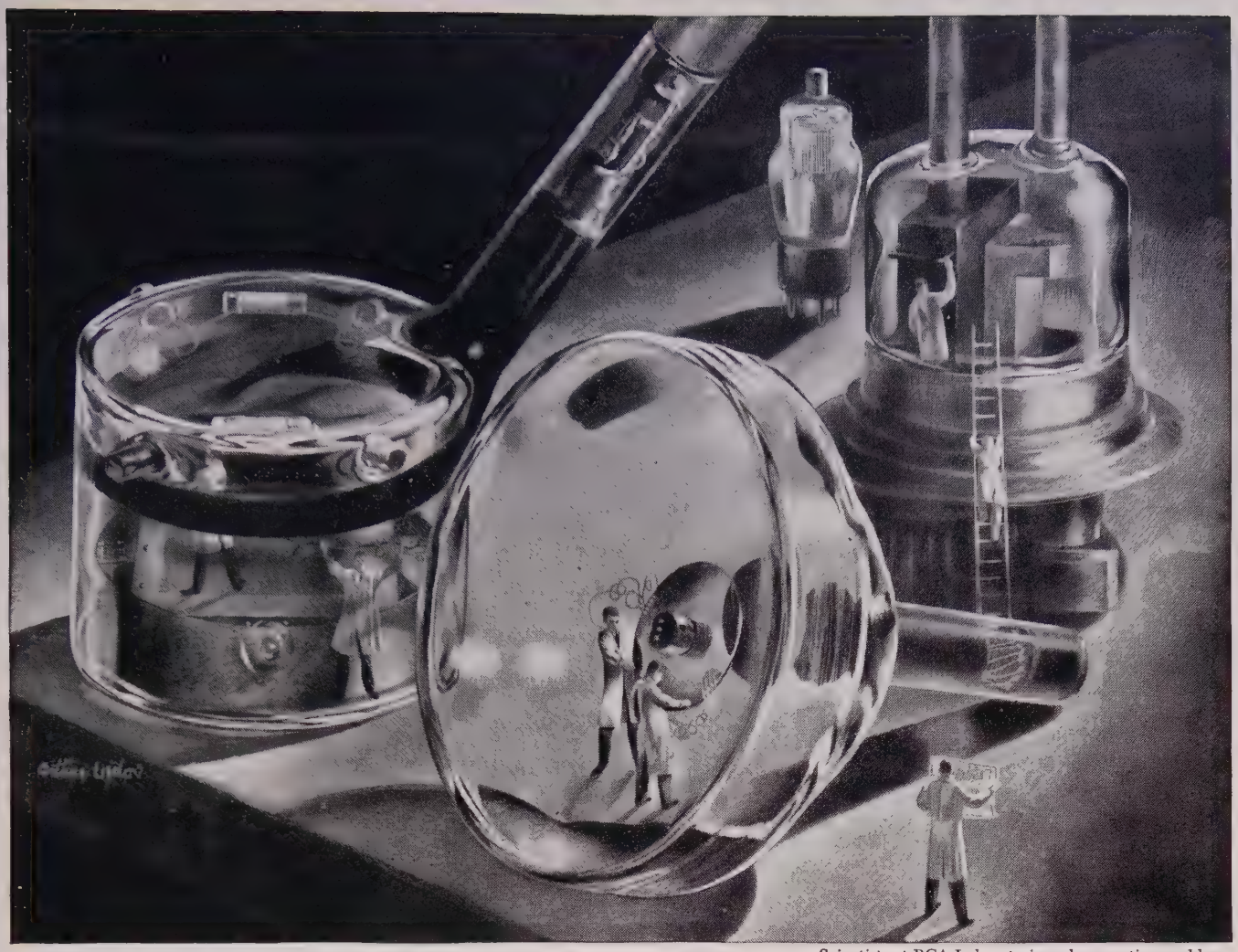
* * *

An American traveling in the Netherlands met a Hollander who, on learning the traveler's nationality, said, "Our flag is red, white, and blue, too. When tax season approaches we begin to feel blue, and when we receive our statements we turn white, and when we pay we are red!"

"Yes," replied the American, "but in the United States we see stars as well."



A strip-down of the new Lima-Hamilton diesel switching locomotive shows the Hamilton 9″ x 12″ diesel engine in place. (Photo courtesy of Lima-Hamilton)



Scientists at RCA Laboratories solve exacting problems within the "nothingness" of vacuum tubes.

## *Inside story of Better Television*

Now television is flashing *visual* entertainment, news, and educational material to millions of people daily. The "inside story" of its rapid growth is the history of some remarkable tubes. Inside these tubes, electrons are put to work—to perform, for your benefit, the miracle of long-distance vision.

**The screen of your direct-view television receiver is actually the face of a tube—the kinescope developed by Dr. V. K. Zworykin and his colleagues of RCA Laboratories—on which electrons in motion "paint" pictures. A tube, too, is the "eye" of RCA's Image Orthicon television camera, which can "see" clearly by the light of a match.**

**And since you asked for big-picture television, they developed projection receivers—also a way to "weld" glass and metal, thus speeding the production of 16-inch direct-viewing tubes . . . at lower cost.**

To these basic "firsts," RCA scientists have added advance after advance, which are daily bringing television into the lives of more and more people.

### How you profit

Advanced research in television tubes is just one way in which RCA Laboratories work in your interest. Their leadership in science and engineering adds *value beyond price* to any product or service of RCA and RCA Victor.

*Examples of the newest advances in radio, television, and electronics—in action—may be seen at RCA Exhibition Hall, 36 West 49th Street, N. Y. Admission is free. Radio Corporation of America, Radio City, New York 20.*

### Continue your education with pay—at RCA

**Graduate Electrical Engineers:** RCA Victor—one of the world's foremost manufacturers of radio and electronic products—offers you opportunity to gain valuable, well-rounded training and experience at a good salary with opportunities for advancement. Here are only five of the many projects which offer unusual promise:

- Development and design of radio receivers (including broadcast, short wave and FM circuits, television, and phonograph combinations).
- Advanced development and design of AM and FM broadcast transmitters, R-F induction heating, mobile communications equipment, relay systems.
- Design of component parts such as coils, loudspeakers, capacitors.
- Development and design of new recording and producing methods.
- Design of receiving, power, cathode ray, gas and photo tubes.

*Write today to National Recruiting Division, RCA Victor, Camden, New Jersey.*

**Also many opportunities for Mechanical and Chemical Engineers and Physicists.**

**RADIO CORPORATION of AMERICA**

*World Leader in Radio — First in Television*

## Talgo . . .

(Continued from Page 11)

nel section side plates hold the side posts in position.

The two purlines, those roof members which are parallel to each other the length of the car, consist of extruded "J" sections.

The unit ends of the coaches are of Plymetl where partitions are required; otherwise they are open in order to form a continuous coach. The two diaphgragms which are applied between all

A finished Talgo unit is ready for coupling to another unit. (Photo courtesy of American Car and Foundry Company)

units provide a smooth exterior and interior, but are principally for weather protection. The diaphgrams are closed by specially designed zippers with sealing lips which will hold through all degrees of tension; they pressure-proof the closure and form a dead air space for insulation.

These combined features have cut down the initial costs in locomotion. It is to be remembered also that there is a resultant lower fuel consumption.

The couplers on the Talgo are entirely different from those of convention cars. When uncoupling a Talgo unit, the process is pretty much like uncoupling a truck trailer. Two five-inch dolly wheels are lowered to the track to keep the unit upright since there are only two conventional wheels on the unit. Under ordinary operation, these support wheels are folded into the floor hidden from sight.

The entire train is powered from the locomotive. This includes electricity for the train as well as for traction. Head-end generators provide 208/120 volts, 50 cycle three-phase *AC* power to the train. A special ACF-designed lightweight air-conditioning system provides year-round weather control with freon refrigerant for cooling and electric air heaters for heating.

*The Locomotive*

The cab structure is all-welded—of girder type design to keep deflection to a minimum. The latest metallurgical processes were used to reduce welding distortion and creep in the assembly.

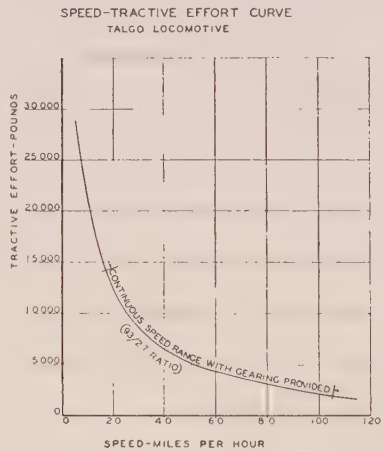
In the underframe, 12-inch LAHT channels are spaced 42 inches apart from the center sills and only one cross-bearer is used. The exceptionally wide spacing was made in order to permit the main propulsion engines to be suspended as close to the rail as possible. Welding was used throughout and the entire underframe structure is stress-relieved.

The main propulsion engines consist of two Hercules model DNXV8S diesels connected to the traction generators through a ventilated bell housing. Low weight per horsepower is obtained in the diesels (approximately 13½ *lb/hp*) by fabricating many of the frame members from low-alloy high tensile steel into a compact design.

The exceptionally wide range of speed - tractive - effort performance (17 *mph* to 105 *mph* without exceeding the continuous rating of the traction motors) is the result of using two extra heavy-duty motors with each of the 405 *hp* input generators. This means that the locomotive can be used with equal facility both in high-speed level operation and in heavy grade mountain service.

Rubber-in-shear engine mounting units, probably the largest ever used in locomotives, practically eliminate vibrations in the structure. This vibration elimination should increase the over-all life of the vehicle and reduce the maintenance considerably.

As can be seen from the foregoing description, the name Talgo not only signifies a train that is lighter and joint-unit built, but also stands for a new advance in the science of railroading. There have been many new designs introduced within the past 20 years but none as spectacular and revolutionary as this.




The Talgo has a remarkable range in its speed-tractive effort performance. (Photo courtesy of American Car and Foundry Company)

The Talgo doesn't look like a conventional train. Low-slung, it resembles a tubular snake as it makes the turns without slackening speed whatsoever. Doors for entry are spaced every fifth car (unit), with the wheels practically concealed. It looks exactly what it is—a departure from the conventional and a change for the better.

The Talgo is definitely a train of tomorrow. And who knows—you may be riding in it tomorrow.

---

GENERAL DATA AND DIMENSIONS

| | |
|---|---|
| Type | B-B Diesel-electric |
| Control | Single End |
| Weight, service | 135,000 *lbs.* |
| Weight per driving axle | 33,750 *lbs.* |
| Length, coupled | 43' 5-3/4" |
| Height, over horn | 12' 6" |
| Width, over handrails | 10' 7-3/4" |
| Horsepower, total | 1150 *hp* |
| Engines: | |
| Propulsion: Two, V Type, 8 cyl. supercharged automotive type diesels | each 405 *hp* |
| Auxiliary: Two, 6 cyl. -in-line, automotive type diesels | each 170 *hp* |
| Engine Mounting | Rubber |
| Number of Traction Motors | 4 |
| Speed | Geared to 105 *mph* |
| Track Gauge | 5' 5-13/16" or 4' 8-1/2" |
| Truck Centers | 23' 6" |
| Trucks | Two, 4-wheel, Cast Steel |
| Truck Wheel Base | 7' 9" |
| Wheel Diamter | 33" |
| Journal Size | 5-1/2" x 10" |
| Journal Bearings | Roller |
| Pedestal Openings | 9-1/8" |
| D.C. Control Voltage | 75 *v* |
| Battery | 32 Cell. |
| A.C. Supply (Train and Loco.) | 208/120 *V*, 3-phase |
| Air Brakes | Straight Air |
| Speed Governor | Axle Gen'r. |
| Braking Power | 250% at 100 *lbs* |
| Sand Capacity | 8-3/4 *cu. ft.* |
| Fuel Oil Capacity | 600 *gal.* |
| Water Capacity (Train Service) | 300 *gal.* |
| Rear Coupler | Special |

---

*Physics Prof: "Now, Smith, what are you doing—learning something?"*

*Smitty: "No, sir, I'm listening to you."*

* * *

Jo: "What is the outstanding contribution that chemistry has given to the world?"

Flo: "Blondes."

* * *

*Hobo: "Lady, have youse got any old cast-off husband's clothing?"*

*Lady: "Why, no, we're still living together."*

* * *

Dear folks: Please send $400 at once; the school is bankrupt and each student has to pay double tuition. Kindly make the check out to me. Your son, Elmer."

# Why we know this wax carton will stand up

Cartons and wrapping papers coated with paraffin wax have been used in food packaging for many years. They must be able to withstand rough treatment. Their ability to stand up depends largely on the strength and sealing qualities of the coating agent. Yet until a few months ago, there was no accurate way to measure these qualities in paraffin wax.

Recent experimental work in Standard Oil's laboratories has resulted in a new electrically controlled quantitative test. Expressed as Indiana Coating Index, this test gives, for the first time, an accurate yardstick of wax qualities which may be correlated with performance in service. It makes possible the production of *uniformly* high quality coating agents.

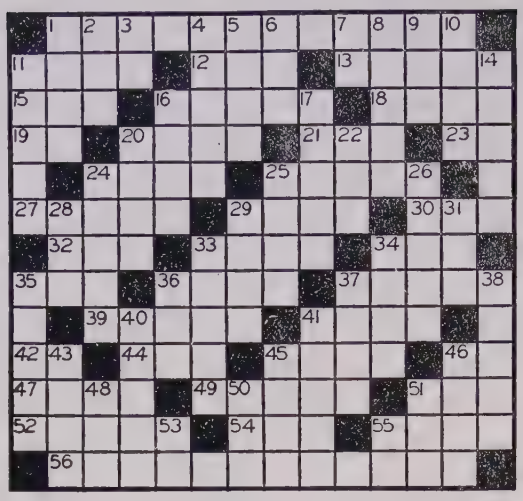
The Indiana Coating Index is only one of many scientific tests developed in Standard Oil laboratories. Standard pioneered in quality-testing, as it did in developing many petroleum products that have contributed to better living. There is no ceiling on what can be accomplished by Standard Oil researchers, present and future.

## Standard Oil Company

(INDIANA)

STANDARD

# Crossword Puzzle



**ACROSS**

1. His high-frequency alternator made radio broadcasts possible
11. Metric unit of weight
12. Confede ate general
13. Unit of angular motion
15. Eroded
16. Inventor of a wireless tuning-in device
18. Cain's younger brother
19. You and me
20. At which time
21. Unit of wire measure
23. Note of the musical scale
24. Bellow
25. Units of a storage battery
27. Inventor of the strip process for insulating wire
29. Important ingredient of linoleum
30. T-shaped pipe connection
32. Garden tool
33. In 1871, he transmitted music by telegraph
34. Fall behind
35. Obtained
36. Relating to the mouth
37. Thirteenth-century electrical experimenter
39. Young pigeon
41. Religious recluse
42. Size of shot often used in airguns
44. Footed vase
45. Early form of electric battery
46. Division of the Bible: abbr.
47. Eat into, as with acid
49. Radio-controlled airplane
51. Fuss
52. Connecting piece between fishhook and line
54. Mohammed's son-in-law
55. Metal used in most magnets
56. Current indicator

**DOWN**

1. Painting, sculpture, etc.
2. Town in NE New Guinea
3. Printers' measure
4. Change
5. Atmospheric gas used in some electric lights
6. Animal's home
7. Rupees: abbr.
8. Stop by overloading
9. Globe
10. French Christmas
11. German scientist who founded the mathematical theory of electricity
14. Movable contact member of a switch
16. Former ruler of Persia
17. Hard abrasive substance
20. Carry: colloq.
22. Each: Scot.
24. Tumultuous uprisings
25. Common source of energy in generating plants
26. Pile of hay
28. Unit of electrical conductance
29. Ill-tempered person
31. Self
33. Thousand dollars: slang
34. Inventor of the discharging-jar electrometer in 1767
35. English inventor of an alternating-current transformer
36. Belong to 19 Across
37. Proposed C. G. S. unit of momentum
38. Another name for radon
40. Subdue
41. Drop
43. The famous "Groaner"
45. Game played on horseback
46. Scent
48. Popular beverage
50. Operated
51. Metric surface measure
53. Fifty-five
55. The very thing

"My worst sin," she sighed, "is vanity. I spend hours every day admiring my beauty."

"That's not vanity," her friend replied; "that's imagination."

* * *

*A man in the insane asylum sat fishing over a flower bed. A visitor approached, and wishing to be affable, asked, "How many have you caught?" "You're the ninth," was the reply.*

* * *

For about an hour a man from Denver had been boasting to an Irishman about the magnificence of the Rocky Mountains.

"You seem might proud ov thim mountains," the cordial Irishman observed.

"You bet I am," replied the man from Denver. "And I ought to be, since my ancestors built them."

The Irishman thought this over for a few minutes and then asked: "Did you ever happen to hear ov the Dead Sea in—in one ov the old countries?"

"Yes, indeed," replied the man from Denver. "I know all about the Dead Sea."

"Well, did you happen to know that me great-grandfather killed the thing?"

(Answers to puzzle on page 46)

'Twas the night before Christmas,
And all 'round the Tech,
The staff was still working,
Each breaking his neck.

This December issue,
Was fouled through and through,
Pictures were late,
And stories past due.

The deadlines were set,
But meant not a thing,
The gang had exams,
Excuses they'd sling.

The publishers, too,
Were slow setting type,
The time went too quickly,
The fruit's overripe.

The editor was slow,
Writing his ditty,
Trying to blast,
Instead of be witty.

But now that it's done,
We hope that this issue,
Will be sent in time,
So we might all wish you

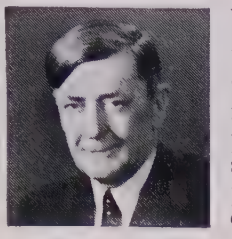
*Merry Christmas*

# EXPLORE

# New Frontiers of Industry!

*By* EDWIN H. BROWN, *Vice President, Engineering Development Division*
*Allis-Chalmers Manufacturing Company (Graduate Training Course 1908)*

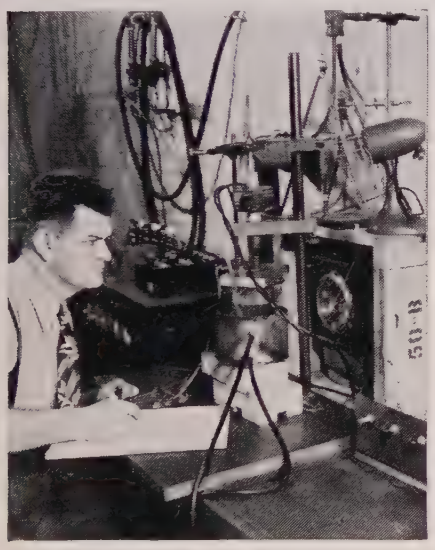
WILL IT WORK? Is it practical? Is there a *better* way to do it? If you feel the challenge in questions like these and get a thrill out of finding the answers — perhaps you're cut out for research.



EDWIN H. BROWN

There are a lot of us like that here at Allis-Chalmers. Pioneering beyond the immediate frontiers of industry has been one of the major factors in the growth of this company for over 100 years. Yet today we're finding more exciting frontiers to explore than ever before.

My part in this work started back in 1906 when I joined the Allis-Chalmers Graduate Training Course, from the University of Nebraska. During my two years in the course, I spent a good deal of time on the test floor. That's the spot where original thinking, new designs, and new methods pay off in results. It's a great vantage-point from which to watch industrial development at work.



**Measuring cavitation resistance** of various materials for pumps and hydraulic turbines. Material under test is electronically vibrated at a high rate while submerged in water.

After completing my GTC, I worked as a test engineer . . . as development and sales engineer on steam turbines . . . as a chief engineer and department manager . . . and into my present work in research and development.

### Unusual Range of Activities

Research here at A-C covers a tremendous range of industrial fields. I might point out that product development is considered a responsibility of each product department, while the central research and development organization works with the many departments in a staff capacity. Since Allis-Chalmers produces important machinery for every basic industry, you can see that our development work is extremely varied.

It includes such things as methods of burning coal deposits underground, to produce power without the intermediate steps of mining, processing and transporting the fuel to power plants. We're developing equipment for the application of atomic power in naval vessels. Working closely with engineers of the Turbopower Development Department, we're developing gas turbines for ship propulsion and high-temperature gas turbines for locomotive service, burning powdered coal.

Other engineers and scientists are engaged in pure physical research into factors that influence power transmission over long lines. There's constant departmental research and product development going on in the fields of flour milling, ore processing, water conditioning, hydraulic turbine design, electronics, new manufacturing methods and techniques, industrial design.

### Pick Your Spot

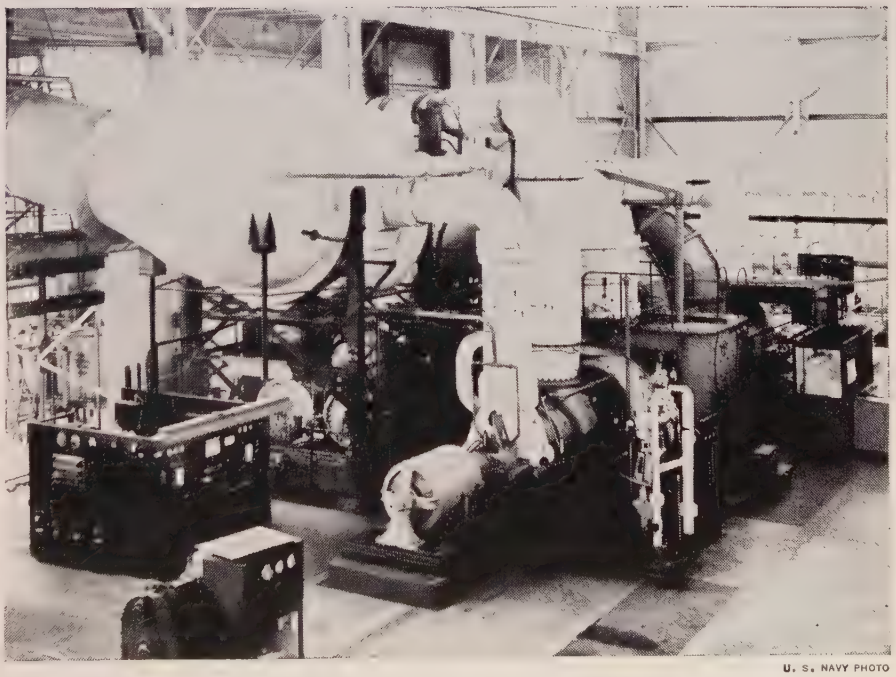
Graduate engineers selected for the Allis-Chalmers Graduate Training Course have a unique opportunity to explore many engineering and industrial fields, and find the work that suits them best. Here, you help set your own course—may change it as you go along and special interests develop. You can gain first-hand experience with almost any major industry you can name—electric power, mining, wood products, hydraulics, public works. You can work in machine design, research, manufacturing, sales engineering. You can earn advanced degrees in engineering at the same time. When you finish the course, you know where you're headed— and you're on your way!

**Write for details** of the Allis-Chalmers Graduate Training Course—requirements, salary, advantages. Representatives may visit your school. Watch for date.

*Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin*

A-C ALLIS CHALMERS

# ALLIS-CHALMERS



U. S. NAVY PHOTO

**Experimental Gas Turbine** at Annapolis is shown in new building to which it was recently moved. After extensive testing at progressively higher temperatures, the U. S. Navy unit has now been operated in several tests at its design temperature of 1500° F.

## Engineering Urge . . .

(Continued from Page 12)

do you want to end life? Do you want to be rich? Do you want to be famous? Do you want to have power? Do you want to render service? Or do you want to wander and end where you will?

The man in Chicago who does not know whether he wants to go to New York or San Francisco is not likely to get to either. Likewise the man who vacillates between riches and service is no more likely to get the one than he is to render the other. Moreover, the man without a definite goal is likely to be a tramp on life's highway, following the road of least resistance and arriving nowhere. The first question, therefore, is, "What will be your principal aim in life?" Do you want to be rich, famous, or powerful; or do you want to render service?

*Give or Take*

The product of life is character. Character forms slowly. It is plastic while forming, but once set, it is hard and resists change. The characteristics of a young man are many and varied, but in an old man some one characteristic predominates. Benevolence becomes a habit through a lifetime of practice. Selfishness becomes a fixed trait upon continually trying to get the lion's share of everything. A bully is defined as a person who continually intimidates others by manner or threat.

Some methods, not all, of getting rich require that one disregard the rights of others, or even require that one take what morally belongs to another. Some methods, not all, of attaining power require that one bluff and brow-beat his associates. Some occupations promise great riches, but only through the destruction of character; other occupations are incompatible with wealth yet develop characters of the highest type.

The aim of life has not been fixed until, not only a desired acquisition, but also the desired character has been selected. For wealth obtained by sharp practice is as far from wealth and benevolence as plenty is from poverty. If you want riches and honesty you must not, in your eagerness for riches, do that which develops selfishness and dishonesty. Likewise if you want power and meekness, and they are often found together, you must not, in your eagerness for power, become a bully.

Of the two aims of life, acquisition and character, character is the more desirable. Acquisition is from without, whereas character is from within. *Character without acquisition may be victory, but acquisition at the expense of character is defeat.*

Having decided upon the aims to be attained, you are in a position to study the various occupations and select the one which will most easily enable you to attain these aims. Any productive occupation industriously and properly practiced by a man having ability in that occupation will result in a high type of character and sufficient wealth to meet any reasonable wants. The problem, then, is to select the occupation in which one has a sufficient interest to be industrious and the occupation for which he has the peculiar type of ability required. The solution of this problem requires consideration of the following questions:

1. What is the nature of the work? If you are planning on being a civil engineer you want to know what a civil engineer does. What does a civil engineer do the first year, the first five years, and the first ten years after graduation? By this is meant, not the spectacular thing which he does once a year, but the routine of work which he does eight hours a day, six days a week, and fifty-two weeks a year. Is this the work *you* can do with interest? If so industry will be a pleasure. Or is it work for which the pay envelope will contain the whole compensation?

2. Under what conditions will the work be done? Will it be indoors or outdors? Will it permit home life? Will location be permanent or will it require shifting from place to place? Will it be in the city or in the country, in settled or desert places? Will there be danger or safety?

3. What compensation may you expect the first year out of college? The first five years? The first ten years? What are the big prizes for the few highest men in the profession in money, in fame, in power?

4. What will your personal relationship to other men be? Will your relationship be mutually pleasant? Will you have to bulldoze others to get ahead? Will you have to keep others from bulldozing you to keep from getting behind? Will you be called upon to inflict injustice to others? Will you be called upon to promote business activities which are questionable?

5. What are the chances for failure? Do all men in the profession succeed in making at least a living or are some compelled to give up and shift to other work to make a fair living?

6. Is the profession looked upon with honor? Does the mere fact that you are in the profession give you prestige?

8. To what extent do you possess the required personal attributes? Do you have sufficient interest in the profession to induce you to overcome any natural deficiencies?

The first reaction in reading these questions is that they are extensive and unnecessarily formal. This is because they are questions which we have never considered—a fact which only increases their importance.

*Natural Selection?*

To answer the above questions intelligently requires an amount of knowledge and a power of self-analysis not possessed by the average freshman. That is to say, the average student selects a course in college at a time when he is wholly unprepared to select the line of endeavor in which he should spend his whole life. To expect an intelligent selection at this time is to expect the impossible.

To realize the truth of this statement it is only necessary to talk with freshmen about the factors which led to the selection of their course. It is true that some freshmen have pretty definite reasons for their selection, but in many cases the decisions are based upon conceptions that are preposterous and which show a lack of knowledge of true conditions which is lamentable.

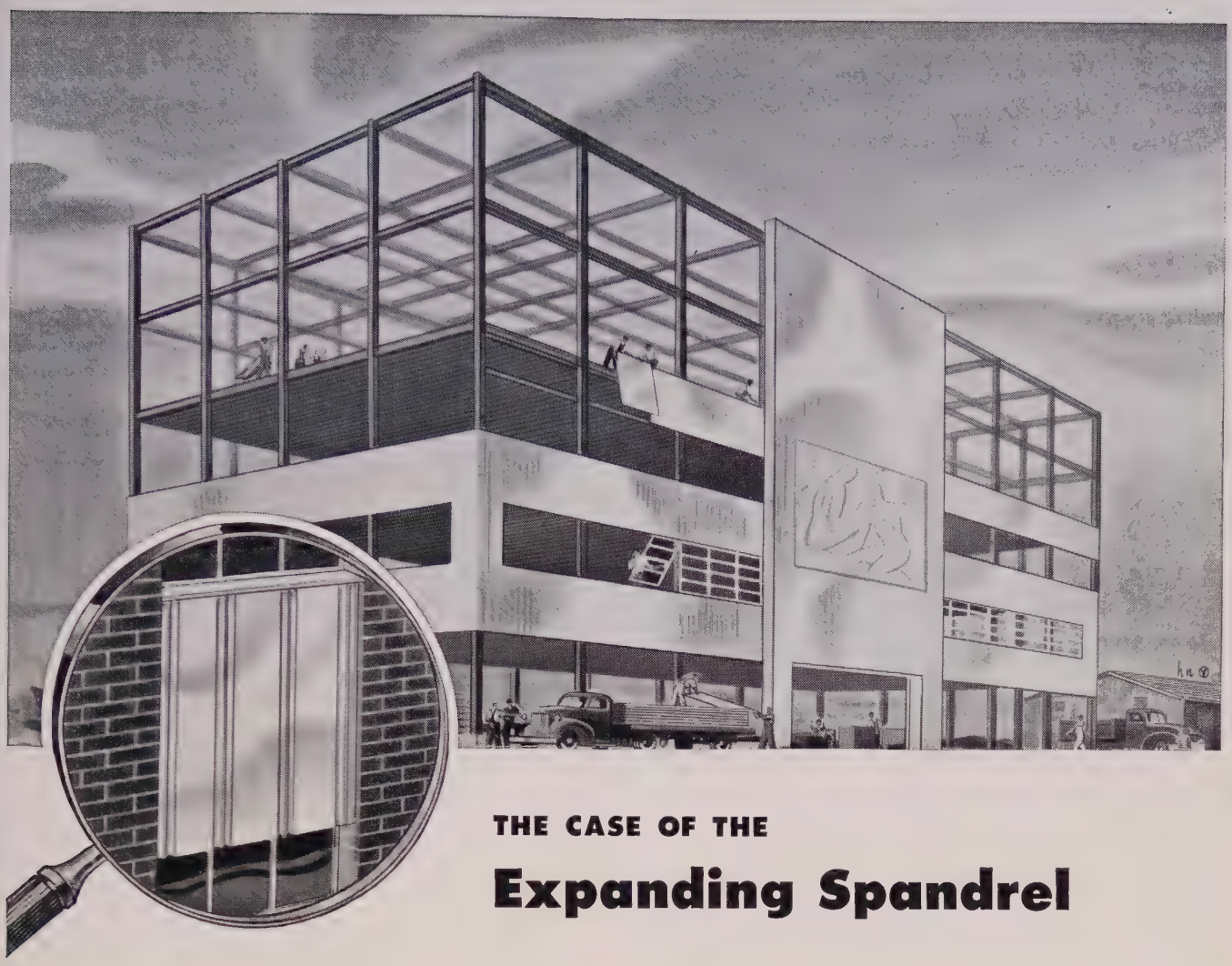
It is true that many students do select courses preparing them for work which they like and in which they are successful. This is due in part to the fact that a boy's liking for a profession, illogical and unanalyzed as it may be, develops an industry and application which will make him proficient even though his greatest native ability may be along some other line. Proficiency, in turn, breeds interest and enjoyment which overcome some slight misfortune in the original selection. Good training may also overcome considerable lack of native ability.

Although the adaptability of youth partly overcomes the misfortune of a wrong selection, this fact should not be permitted to interfere with a later, and more intelligent selection, if the first is found to be ill-advised. To persist in trying to be a lawyer because one has a law degree is to persist in going to the wrong city because one has turned onto the wrong road.

*It's Not Too Late to Think!*

To senior engineering students the selection of a permanent occupation is a serious matter. Many of you were brought up on a farm, but thought you would like to be an engineer rather than a farmer. The decision may have been based upon the idea prevailing among youth in most rural communities that the city man is in some way superior to the farmer, and that to be ambitious is to go to the city. Or the decision may have been based on a real and very strong dislike for farm life. Or it may have been based upon a real longing for the city. But in most cases the decision was made without a knowl-

(Continued on Page 32)



## THE CASE OF THE

# Expanding Spandrel

Night and day, winter and summer, year after year, for more than twenty-six years aluminum spandrels (the vertical area between windows in skyscrapers) were exposed to the weather . . . and nothing happened.

That was proof enough for the architects.

Proof that Alcoa Aluminum castings used for spandrels stood up in all kinds of weather, resisted corrosion, kept up their good appearance, never needed maintenance.

"Aluminum works so well for spandrels," reasoned the architects, "why not expand its use . . . make entire walls of it?" They came to Alcoa with their ideas. Alcoa engineers had kept pace. Designs and methods for making complete walls were ready. New ways had been found to make aluminum cheaper and more useful.

Today you will see aluminum-clad buildings going up in every part of the country. These buildings are quick and inexpensive to build. Their aluminum walls never will need expensive painting or repairs.

This case is typical of the history of Alcoa and of the men and women who work for it. While aluminum was proving itself in small applications, Alcoa engineers were perfecting the methods for large scale production and fabrication Within the lifetime of men now living, this company has grown to be one of America's great industries. New developments now underway in Alcoa's laboratories are pointing the way to even more widespread uses for aluminum in the years ahead. ALUMINUM COMPANY OF AMERICA, Gulf Bldg., Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN ALUMINUM

## Engineering Urge . . .

(Continued from Page 30)

edge of the nature of the real life and work of an engineer.

Whatever the reasons for your decision four years ago, the important question is, "Do these reasons hold?" You are face to face with your first job. If a careeer is really planned, instead of being permitted to happen, each job should be a preparation for the jobs which follow. The selection of your first job should affect your whole professional life. Certainly before such an important and decisive step is taken a man owes it to himself to learn the true nature of the work which he is about to take up.

No problem in mechanics is, to you, so important as the problem of your career, yet you may have worked all night on a problem in mechanics to pass a course. Should you not spend a correspondingly greater time selecting your career since it affects the success and happiness of your whole life?

The college course is selected during or before the freshman year, but your occupation for life should not be finally selected until the senior year or possibly a year or two after graduation. This implies that a man may properly take a technical or professional course and then engage in some other wholly unrelated activity.

*It's Not Too Late to Change!*

Can a civil engineer graduate justify entering the ministry? May a mechanical engineer go back to the farm without being a quitter? Both questions have the same answer, yes—under certain conditions.

If, after graduating as a civil engineer, a man is thoroughly convinced that the only thing he can do and be happy is to preach; if he knows that he can preach; and if he can be content on a preacher's income, then, I say, he should be a preacher and not a civil engineer.

Likewise, if after graduating in mechanical engineering, a man is thoroughly convinced that the only thing he can do and be happy is to farm; if he knows that he can farm; and if he can be content in doing a farmer's work and living a farmer's life, then, I say, he should go back to the farm and not be a mechanical engineer. And no man has a right to call him a quitter.

*Four Years Lost?*

Will not leaving the profession for which one's college course has prepared him be equivalent to scrapping his college work? Even if this were so, it is better to throw away four years than to spoil the remainder of a lifetime.

But such a shift does not mean scrapping a college course. Preparing for a particular profession is only one of many objectives of a professional or technical course. Every college course should teach the student to think clearly, to write and speak correctly, to learn scientific facts and laws, to collect and deduce data, and to apply scientific knowledge to the solution of problems. These aims are common to all college courses and they compose the major part of the preparation for all professions.

A civil engineering course that would not help a farmer, a banker, a lawyer, or a merchant would be of little use to a civil engineer. It would be folly to argue that to prepare for one profession and to follow another curtails no loss; but while there is some loss, the loss is small.

The danger of advising, or even admitting, that it may be proper, under certain conditions, to follow one profession after having prepared for another, is that a man who is really a quitter may use the advice to justify jumping from one occupation to another. It must be clearly understood that a man is advised to change from one profession to

(Continued on Page 34)

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- √ 4 changes of work speed
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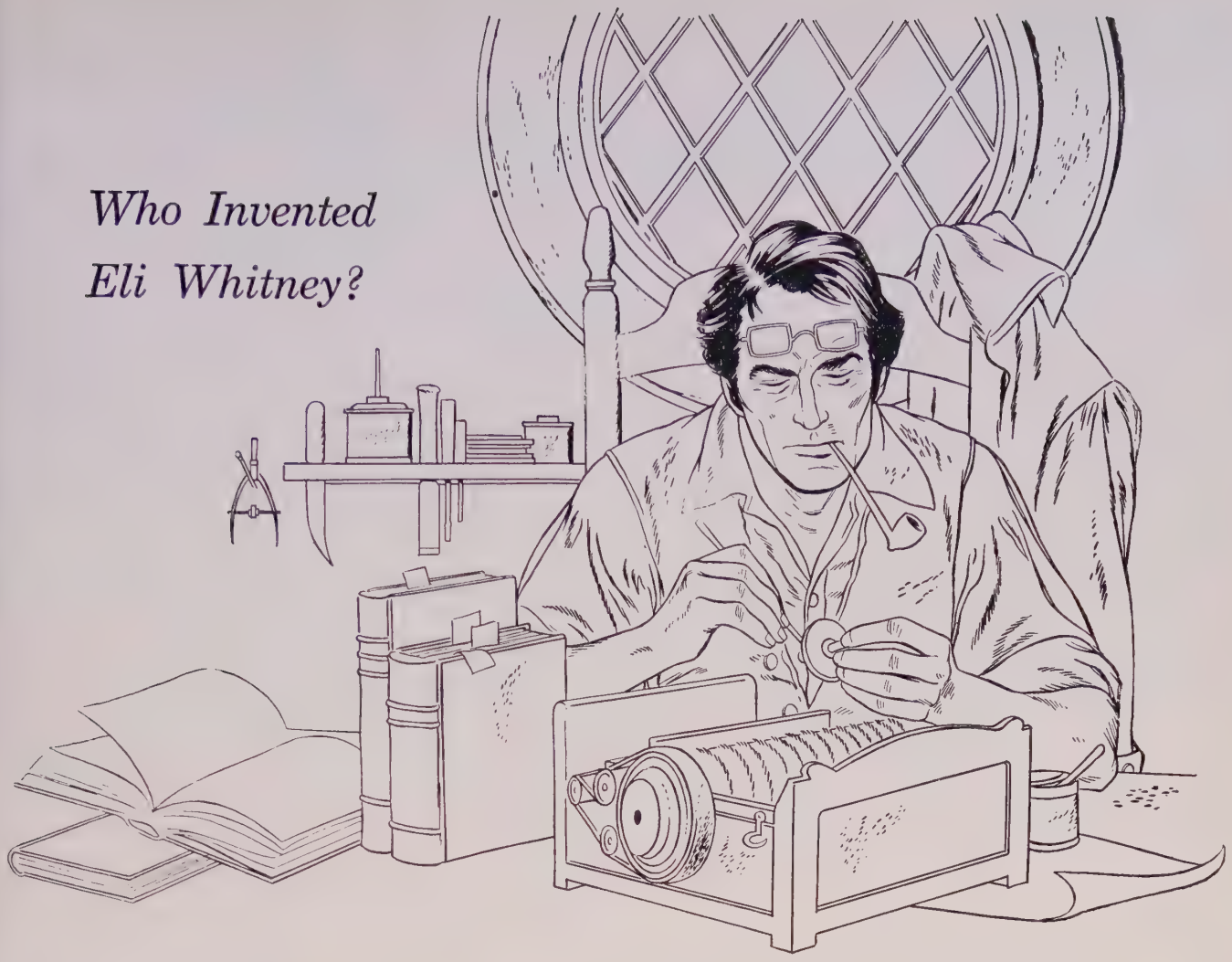
# *Who Invented Eli Whitney?*



In 1793 Eli Whitney helped a growing nation take another step in the direction of greatness. Inventions like his made and keep America great. But what does the greatness of American inventors and technology prove?

It proves that Americans are better trained than other people in the scientific and technical fundamentals so necessary for the continuing progress that has kept America the world's greatest nation. In America, the finest textbooks are available to all. This is the background for the technological advances that raise one country above all others.

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HEADQUARTERS FOR TECHNICAL INFORMATION

*330 West 42nd Street, New York 18, N. Y.*

## Engineering Urge . . .

(Continued from Page 32)

another only under the following conditions:

1. He has studied the new occupation and knows that he will be happier in the new than in the old.
2. He knows that he is, or can become, proficient in the new occupation.
3. He has studied the new occupation and knows that he will be content with the remuneration, working conditions, environment, and personal relationships incident thereto.

The advice to change is not offered to the man who is disgruntled, to the man who finds his present work hard and tedious, or to the man who is a failure generally. One or more of these disagreeable features may be due to a poor selection of the occupation, but they may also be due to the individual. If the latter is true, they will follow him wherever he goes.

What is wanted is not merely a change from one occupation to another, but a change from one occupation unfortunately chosen in ignorance to an occupation chosen with the full knowledge of the occupation and of your own ability and interest.

There are round holes and round pegs; likewise square holes and square pegs. The round pegs should be in the round holes and the square pegs should be in the square holes. If you are a square peg in a round hole you should change.

But before you jump out of the round hole, be sure that you are really square; and be sure that the new hole is likewise square. Also remember that a square peg often can easily be rounded.

## Boneyard Bilge . . .

(Continued from Page 19)

of a very modern and entirely automatic system. The alarm is set off in a University building whenever there is a sudden increase in temeprature, and is transmitted through the automatic recorder onto a tape. At the same time, the fire department lights are automatically turned on. The control man then reads the tape and informs the crew of the location of the fire. He also notifies the Champaign fire department, the Urbana fire department, and the water company on a four-way generator telephone. Finally he contacts the police on the local station WAGR. During fires, the control man maintains a two-way radio communication with the trucks.

The University fire department is constantly on the alert to protect the personnel and equipment of the University.

## E. E. Field Trip . . .

(Continued from Page 18

not to overload the accommodations of the place visited.

Several of the plants were of interest to both options and were on the schedule of all groups. Among these were Allis-Chalmers and General Electric X-ray at Milwaukee, and Western Electric and a steel mill in Chicago. The remaining plants visited were split according to options. The power option visited a power plant and General Motors Electromotive Division, while the electronics option went to Illinois Bell and Motorola.

Prof. E. A. Reid, assisted by Professor Fett, made the preliminary arrangements; members of the AIEE-IRE took care of the details. Two members of the faculty accompanied each bus.

Several fellows who live in Chicago stayed at home while the others stayed at the Palmer House and enjoyed the night life of the Loop.

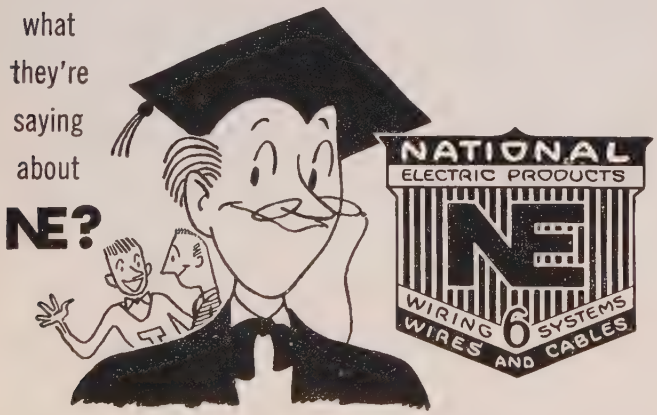
---

A car manufacturer once advertised that he could put a car together in seven minutes. The next day he got a phone call asking if it was true.

"Of course," he said; "why?"

"Oh, nothing much," said the voice on the phone, "but I think I have that car."


Have you heard what they're saying about NE?




Some grad is spreading the word that National Electric is the world's largest single source of supply for electrical roughing-in materials. (And he couldn't be righter!)

Since 1905 NE products have set the pace for quality. Today the NE *complete* line of electrical roughing-in materials includes: wires, cables, conduit, raceways and fittings.

**National Electric**
**PRODUCTS CORPORATION**
PITTSBURGH 30, PA.

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## Ultrasonics . . .

(Continued from Page 13)

coupled to an amplifier system and an oscilloscope. By use of the coordinate system the focal point can be located at any desired section of the nerve which is contained in the holder.

The electrical stimulator, mentioned above, is provided to activate the nerve so that it reacts to ultrasonic sound and sends an electrical impulse into the oscilliscope and is observed by the camera. A square wave form output with variable amplitude and time duration is obtained from the stimulator, and the values of pulse duration and repetition rate can be obtained directly from the instrument dials.

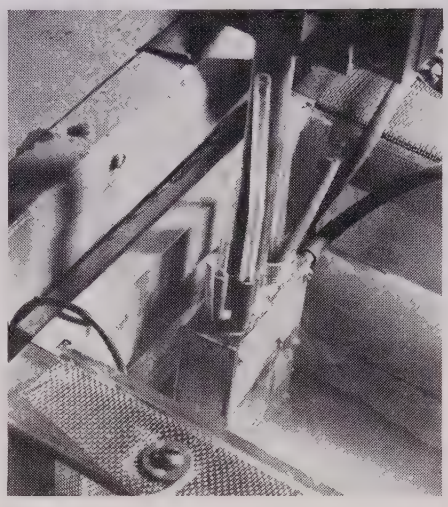
The sound duration is the final thing taken into consideration and is obtained, at present, by manual control only. Duration times are varied from 5 to 30 seconds. For shorter intervals automatic control is necessary. An automatic system is now being developed whereby ultrasonic excitation will follow electrical excitation or vice versa with delay times of 50 microseconds to 1 second.

The apparatus is quite complicated as would be expected of this type of research. The pictures may help to provide an understanding of the physical setup.

*Crayfish*

The major aspect of this project is the testing of nerves. Two types of nerves have been used—frog and crayfish nerves.

Because of the unusual fiber composition of the crayfish nerve it has proved



This closeup shows the projector box and connecting leads to the driver and meters. (Photo by Lou Davidson)

to be the most useful. The composition of the fiber consists of several larger diameter fibers and a great number of smaller diameter fibers. Experiments have proved that the larger diameter fibers are activated by stimulus intesities considerably less than what is required to stimulate the smaller fibers.

At this point it might be wondered how the fibers are separated. A remarkable mechanism, called a micromanipulator, is used by physiologists to do this job of dissecting.

To date only a few experiments have been of much value due to the somewhat crude construction of part of the equipment. Yet, despite this disadvantage, results of tests completed thus far have given an insight as to what might be expected in the future.

*Nerve Testing*

In one test the leg nerve of the crayfish was stimulated electrically slightly above the threshold of the most excitable fiber with a 0.1 millisecond pulse, once per second. When the sound was first turned on the effect produced was a decrease in the latent period. This was indicated by the movement of the spike (as noted on the oscilliscope) to the left. (The latent period is the interval of time between the stimulation and the reaction of the nerve.) A second fiber was also excited because the spike height increased and the latent period again decreased. When the sound was turned off the order of effects was reversed.

In a second test the electrical stimulator was set slightly below the threshold of the most excitable fiber—the sound intensity remaining the same as in the previous tests. The oscilliscope indicated that the same general pattern as in previous the test was obtained.

When the electrical stimulator was set at a level of 75 per cent of the most excitable fiber, a single fiber response didn't occur until after 8 seconds of ultrasonic irradiation; and no other fiber responded during the time of irradiation.

Before conclusions can be drawn from this last statement more information on threshold changes has to be obtained. When no electrical excitation was applied, the activity of the nerve increased greatly when irradiated to sound, and decreased when the sound was turned off.

*Frog Legs*

When the frog sciatic nerves were tested somewhat different results were obtained. In one test the spike height of .5 inches on the oscilliscope was obtained by adjusting the electrical stimulator. The nerve was then irradiated and the spike gradually increased. After the sound was turned off the spike height decreased to the original state.

The results from these tests on the nerves indicate that the return to the

(Continued on Page 38)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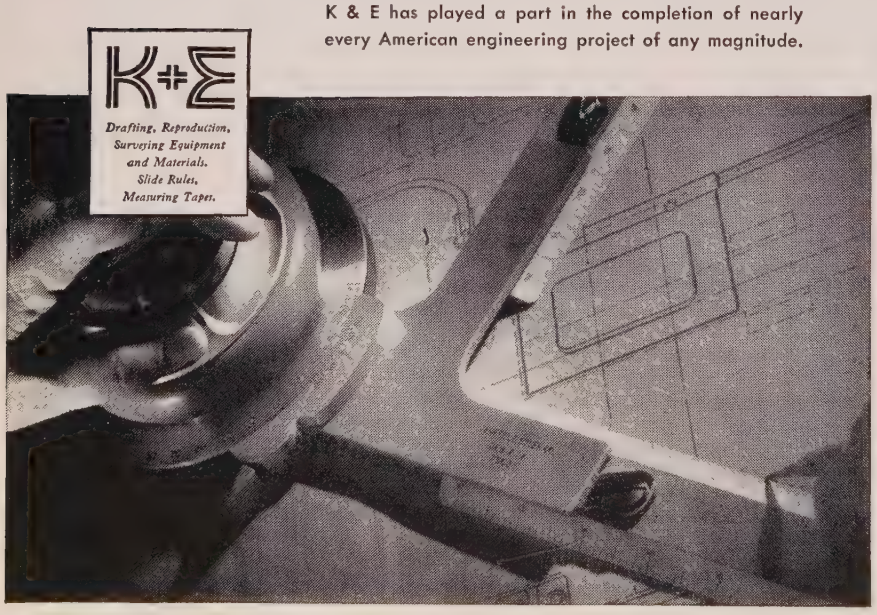


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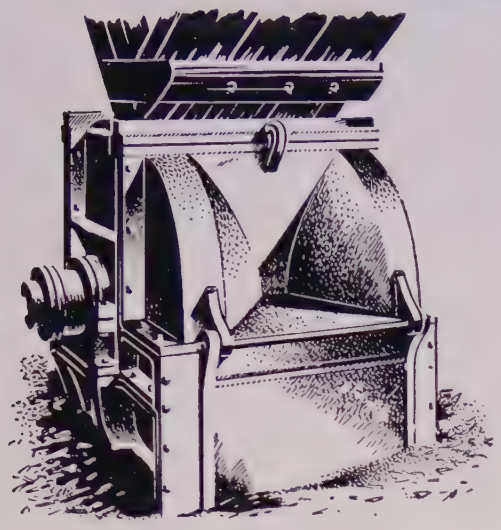
*Another page for* **YOUR BEARING NOTEBOOK**

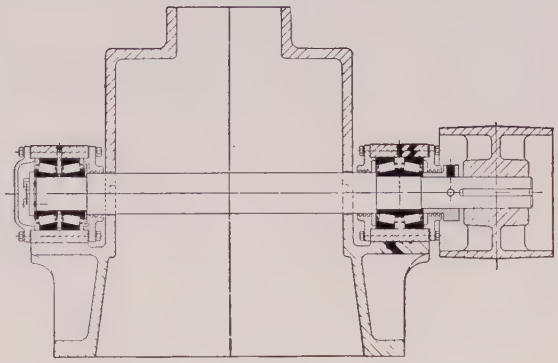


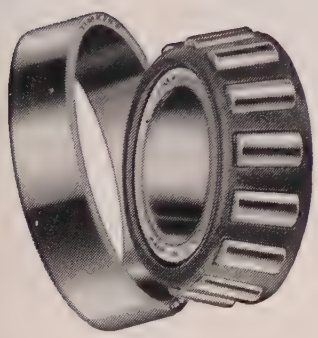
## How to improve a wood hog's appetite

The wood hog shown here chews up logs for paper pulp like a giant pencil sharpener. As they chip away at the logs, the revolving cutter knives impose heavy shock loads on the bearings. To carry these shock loads, engineers specified that the cutter shaft be mounted on Timken® tapered roller bearings. Due to the line contact between the rolls and races, Timken bearings have extra load carrying capacity —take the heaviest shock loads.

## Here's how engineers use TIMKEN® bearings for heavy shock loads

To give extra support to the wood hog's main shaft, double-row Timken bearings are used. The tapered construction of the rolls and races enables Timken bearings to carry both radial and thrust loads in any combination. Shafts are held in rigid alignment, end movement eliminated. Because Timken bearings permit the use of effective closures, lubricant stays in and dirt and moisture are kept out.





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## Want to learn more about TIMKEN® bearings?

Some of the important engineering problems you'll face after graduation will involve bearing applications. If you'd like to learn more about this phase of engineering, we'll be glad to help. For additional information about Timken bearings and how engineers use them, write today to The Timken Roller Bearing Company, Canton 6, Ohio. And don't forget to clip this page for future reference.

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## Small Homes . . .

(Continued from Page 9)

and efficiency, despite space limitations, of kitchens in small homes. Investigation was done on storage space using factory-built cabinets, kitchen design, arrangement of equipment, and window and door locations.

Another recently concluded project is radiant heating of basementless houses. The Engineering Experiment Station in cooperation with the Institute of Boiler and Radiator Manufacturers ran tests in a basementless prefabricated house to obtain operation data about comfort characteristics, fuel costs, and cleanliness of operation of a baseboard radiation unit developed by the Institute. A research home for the purpose of conducting other tests has been maintained by the Institute of Boiler and Radiator Manufacturers at 801 West Green Street, Urbana, since 1940. Much research has also been done on the one-pipe forced circulation hot-water system.

Results of research findings and of information gathered through years of research into various housing problems by departments of the University are available in the form of circulars published by the Council. Twenty-four circulars have been issued to date:

*Selecting a Livable Neighborhood*
*Selecting the Home Site*
*Financing the Home*
*Designing the Home*
*Solar Orientation*
*Planning the Kitchen*
*Insulation in the Home*
*Chimneys and Fireplaces*
*Storm Sash*
*Heating the Home*
*Fuels and Burners*
*Planning for Electricity*
*Interior Decoration*
*Hardware for the Home*
*Moisture Condensation*
*Land Design*
*Septic-Tank Systems*
*A Basic Farmhouse Plan*
*Business Dealings with the Architect and the Contractor*
*Concrete Floors for Basementless Houses*
*Construction Methods*
*Cabinet Space for the Kitchen*
*Homes Planned for Coal or Coke*
*Kitchen Planning Standards*

These circulars are available at 10 cents each, or a complete set for $2. However, students on the Urbana campus may purchase these circulars at a special educational price of three cents per copy.

The educational program of the Small Homes Council includes short courses conducted in cooperation with the Division of University Extension. An annual course in residential construction is designed to bring contractors and builders up-to-date on the best construction methods. Also, in cooperation with the National Retail Lumber Dealers Association, a 30-day short course for lumber yard and building material personnel is held.

## Ultrasonics . . .

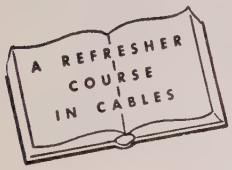
(Continued from Page 36)

original state of excitation depends upon the duration of irradiation. Another thing that was noticed was the fact that the effect of temperature and pressure on activity must be considered.

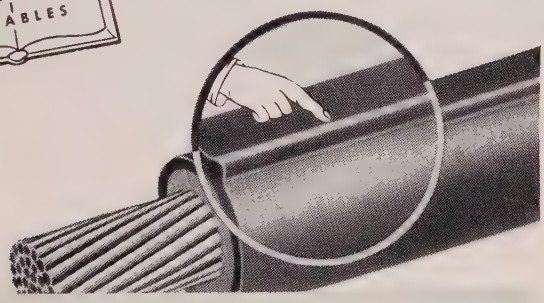
This research problem is typical of the quandary involved in tackling something new. To design proper test equipment, it is necessary to know considerable information about the expected results. On a new project, such as this one, the growing pains may get on ones nerves!

*"Let's play store," said the first child. "I'll be the storekeeper and you be my customer."*

*"No, prices are too high," replied the second little lady. "Let's play radio program, and I'll give away a million dollars."*


LOOK FOR THIS RIDGE



AND

YOU FIND A REASON

● There is more than mere identification value in the ridge you see on Okonite wires and cables. The ridge is proof that the insulation has been folded around the conductor by the well-known Okonite strip insulating process. This method permits inspection at all times during the application operation. It assures the perfect centering of conductors so important to the avoidance of electrical failures.

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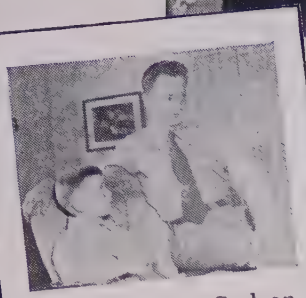
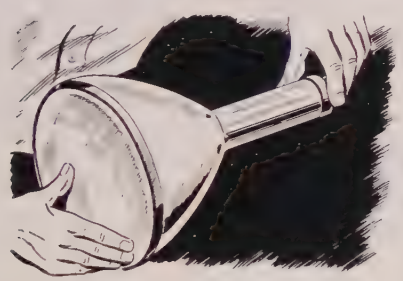


How Bernard Carlson might duck a difficult question and still satisfy 9-year-old Jackie. Questions like this don't stump Bernard. He's had his eyes and ears open at Norton for 15 years. In fact, one out of every two Norton employees has been around more than 10 years.

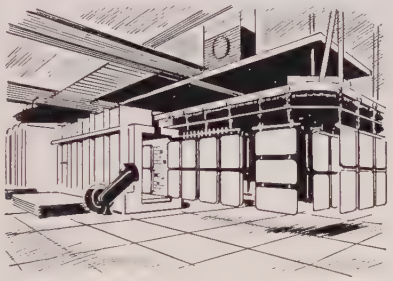
News photo of crowds watching television on Boston Common.

# BUT, DAD, WHAT MAKES TELEVISION SO CLEAR?

"Lots of things, Jackie! But mostly brains. The brains of men who know how to make electrons behave in tubes. Electrons are tiny particles of electricity. They're boiled out of metal wires by heating units. Much the same way as an electric stove boils water. But if the heating unit isn't right, everything goes wrong."



"The tube people are smart, son. They make sure the heating units give off the right heat and last longer by coating them with a fine Norton refractory. Alundum 38900 grain, we call it. It's so fine that ten grains end to end equal the thickness of a piece of paper.



'Alundum refractory grain is great stuff. Its melting point is 2015°C. That's real hot! Made into corrugated baffle plates, it doubles the efficiency of enameling ovens. That's why the surfaces of such things as refrigerators and electric stoves come so hard and smooth.

"Some people know Norton only as the world's largest maker of grinding wheels and machines, Jackie. But refractories in many sizes, shapes and materials are important Norton products, too. They're used in kilns, furnaces and ovens whenever industry wants to get the most out of high temperatures . . . safely."

"So, you see, son, from television tubes to refrigerators, Norton Products help make all kinds of products better. That's why the experienced heads and willing hands that make up the Norton team try a little harder to make Norton products better."

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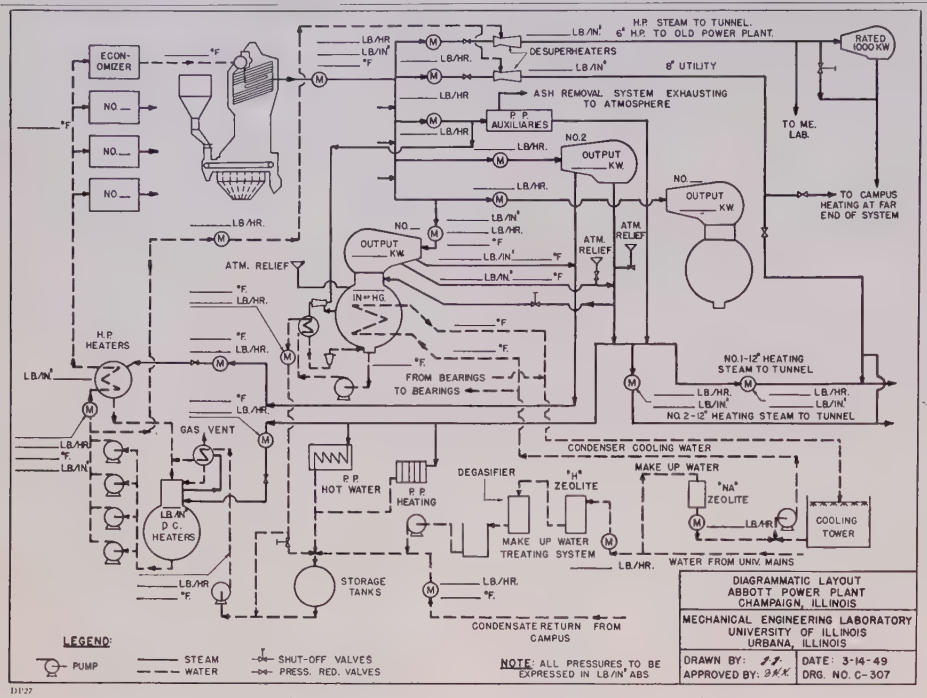
## Power Plant . . .

(Continued from Page 7)

A pressure and temperature reducing station is available to furnish make-up steam when the turbine exhaust is not sufficient. Here the pressure may be reduced from boiler to steam main pressure.

The steam supply to the University buildings is underground through 8'3" x 7'6" steam distribution tunnels. The tunnels contain pipes for exhaust steam, high pressure process steam, return condensate, and compressed air. Scattered conveniently along the tunnels are combined entry ways and ventilators for inspection, repairs, and tunnel ventilation.




DI127

The power cycle evolves from the three 3,000-kw turbine generators, as shown by this mechanical diagram

Many of the engineers on campus become acquainted with the plant via an M.E. course which has an experiment requiring each man to be at the plant one or two hours for an inspection trip. Data are taken on the operation of the plant for a 24-hour period and a formal report is made.

The plant steam and electric load has grown tremendously since 1941, and it is now ready for its second addition. The fourth boiler and third turbine-generator was added during the 1947-49 biennium; and a fourth turbine-generator will be added in the 1949-51 biennium.

---

*"Martha, every time I see you in that hat I laugh."*

*"Good—I'll be sure to put it on when the bill comes in."*

* * *

He: "If you'll give me your telephone number, I'll call you up some time."

She: "It's in the book."

He: "Fine! And what's your name?"

She: "That's in the book, too!"

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To keep inflation out of electric power costs in the face of steadily rising construction and fuel costs, electric utilities are showing a growing preference for one-boiler-per-turbine operation when providing additional electric generating capacity.
Success of this type of cost-saving operation calls for an extremely reliable supply of steam—boilers that will stay on the line day after day, month after month. That B&W Boilers are fully measuring up to this exacting requirement of modern central stations is indicated by the fact that 79 units for one-boiler-per-turbine installations without high-pressure cross connections are now in service or on order. Together these boilers supply the steam requirement for over 4,000,000 kw. of generating capacity. Operating records show that most of these boilers are giving uninterrupted service for eleven months or more, being taken out of service only for the required annual inspections.
Dependable performance has been a distinguishing asset of B &W boilers for over 80 years. It is a foremost reason why B&W steam is still a leading choice for making low-cost power more abundant all over America today.
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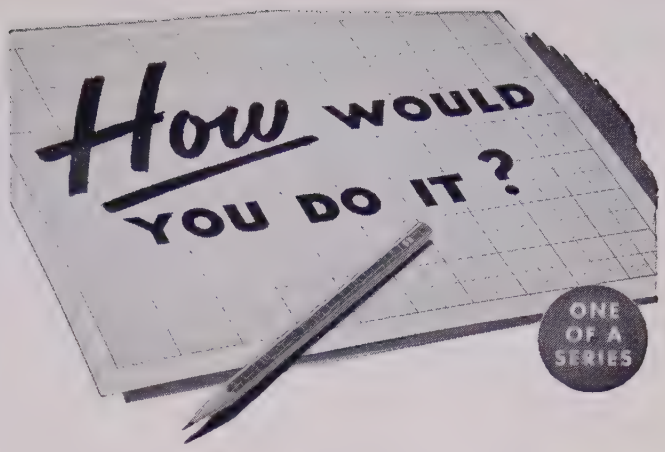


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**THE SIMPLE SOLUTION** — Use an S.S.White power drive flexible shaft to transmit rotary power from a suspended or pedestal-mounted electric motor to the handpiece which holds the finishing wheel. This gives you a portable unit that permits the wheel to be readily manipulated to reach all points.

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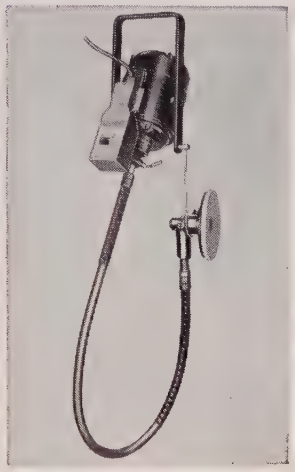

*Here's how one manufacturer did it.*

This is just one of hundreds of power drive and remote control problems to which S.S.White flexible shafts are the simple answer. That's why every engineer should be familiar with the range and scope of these useful "Metal Muscles"* for mechanical bodies.

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## Navy Pier . . .

(Continued from Page 16)

smoker-social sometime during this semester.

With the co-operation of the many new members, the AIEE is looking forward to a successful semester of activities.

### A.I.Ch.E.

An election was held at the first meeting of the 1949-50 school year October 11. The new officers are as follows:

President .....John Pluth
Vice president .....Vito Mitkus
Secretary .....Regina Tarkowski
Treasurer .....John Slack

Plans are being made for a visit to the hydrogenation plant of a soap company in Hammond, Indiana.

On November 1, a film depicting a phase of the chemical industry was presented.

### I.A.S.

The officers elected at the first meeting of the Institute of Aeronautical Sciences are:

Chairman .....Joseph Gross
Vice chairman .....Douglas Miller
Secretary-treasurer .....Ray Kramer
Council Rep. .....Donald Riggs

A film was shown summarizing the many problems connected with aircraft props. It explained the principles and theories needed to maintain accurate functions of the propeller. The title of the film is "Airplane Propellers: Principles and Types."

Mr. Zanotti, the sponsor, is hoping that the plans for a field trip will materialize.

---

Office Boy (nervously): "Please, sir, I think you're wanted on the phone."

Employer: "You think! What's the good of thinking?"

"Well, sir, the voice at the other end said, 'Hello, is that you, you old idiot?"

* * *

*"Thirty dollars to paint my garage? That's outrageous! I wouldn't pay Michelangelo that much to paint my garage!"*

*"Listen, you," said the painter, "if he does the job for any less, we'll come and picket yer place!"*

* * *

Boss: "You're 20 minutes late again. Don't you know what time we start work at this factory?"

New Employee: "No, sir, they're always at it when I get here."

* * *

*One reason why talk is cheap is because the supply usually exceeds the demand.*

* * *

*Before you give somebody a piece of your mind, be sure you can get by with what you have left.*

*The banquet was one in the interest of civic improvement. Every speaker around the table, except one, had advertised the town in flowing terms. They all agreed that had the old home town been on the coast, it would have been the world's first city.*

*The one lone participant at the table who had not spoken, was a visitor. Finally he was called on to say a few words.*

*"Gentlemen," he said, "I am impressed with your town as much as you are, and I believe I can suggest a way in which you can get your wish. This is what you should do: Obtain a large pipe, run it from your town to the ocean, and if you can suck as hard as you can blow, your troubles will all be ended—the ocean will soon be alongside."*

* * *

"Your fiance is a charming man. He has a certain something."

"Yes, but I would rather he had something certain."

* * *

*Visitor: If your mother gave you two apples and told you to give one to your brother, would you give him the little one or the big one?*

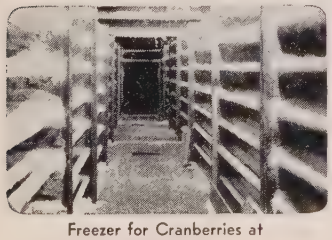
*Johnny: Do you mean my little brother or my big one?*

Cranberry Storage at Sandwich on Cape Cod, Massachusetts

CRANBERRY GROWERS LIKE
Frick Refrigeration

And have used it over thirty years!

Frick equipment serves this industry in three ways: for short term storage at 32°F; for long-term storage at –5°F; and for freezing the berries to be made into juices—thus carrying the rich color of the skin throughout the liquid.



Freezer for Cranberries at Barnstable, Mass.

The three cranberry plants on Cape Cod use seven big Frick refrigerating machines.

Frick Compressors in Cranberry Plant at Chatham, Massachusetts

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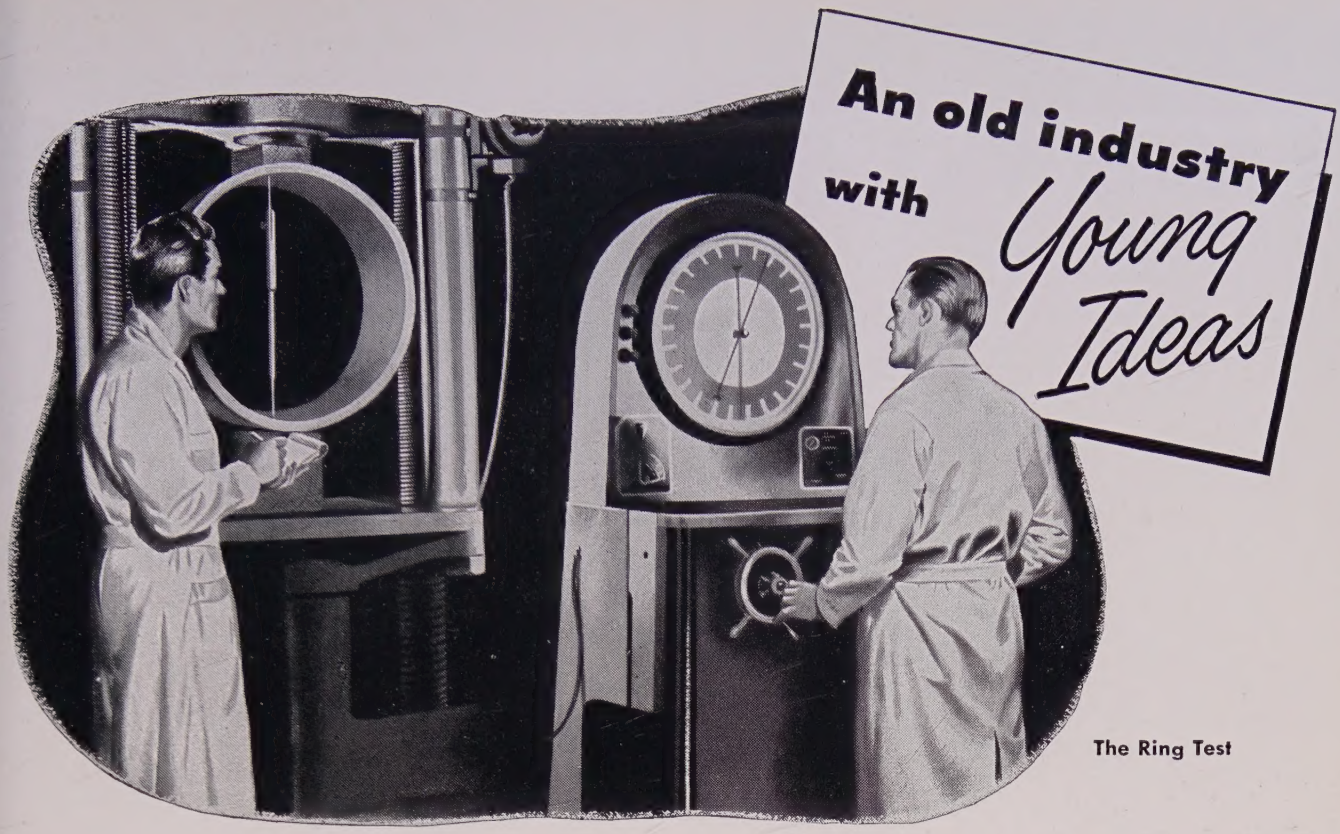



The Ring Test

The ring test, shown above, is a scientific method for determining the modulus of rupture of pipe. It is not a required acceptance test but one of the additional tests made by cast iron pipe manufacturers to ensure that the quality of the pipe meets or exceeds standard specifications.

A ring, cut from random pipe, is subjected to progressively increased crushing load until failure occurs. Standard 6-inch cast iron pipe, for example, withstands a crushing weight of more than 14,000 lbs. *per foot.* Such pipe meets severe service requirements with an ample margin of safety.

Scientific progress in the laboratories of our members has resulted in higher attainable standards of quality in the production processes. By metallurgical controls and tests of materials, cast iron pipe is produced today with precise knowledge of the physical characteristics of the iron before it is poured into the mold. Constant control of cupola operation is maintained by metal analysis. Rigid tests of the finished product, both acceptance tests and routine tests, complete the quality control cycle. But with all the remarkable improvements in cast iron pipe production, we do not forget the achievements of the early pipe founders as evidenced by the photograph below of cast iron pipe installed in 1664 to supply the town and fountains of Versailles, France and still in service. Cast iron pipe is the standard material for water and gas mains and is widely used in sewage works construction. Send for booklet, "Facts About Cast Iron Pipe." Address Dept. C., Cast Iron Pipe Research Association, T. F. Wolfe, Engineer, 122 So. Michigan Ave., Chicago 3, Illinois.

**Section of 285-year-old cast iron water main still serving the town and fountains of Versailles, France.**

**CAST IRON PIPE SERVES FOR CENTURIES**

# Ode to an Engineer . . .

Who is the man that designs our pumps with judgment, skill and care?
Who is the man that builds 'em and keeps them in repair?
Who has to shut them down because the valve seats disappear?
The bearing-wearing, gearing-tearing mechanical engineer.

Who buys his juice for half a cent and wants to charge a dime?
Who, when we have signed the contract, can't deliver half the time?
Who thinks the loss of 26 per cent is nothing queer?
The volt-inducing, load-reducing electrical engineer.

Who takes a transit out to find a sewer to tap?
Who then with care extreme locates the junction on the map?
Who is it that goes to dig it up and finds it nowhere near?
The mud-bespattered, torn and tattered civil engineer.

Who thinks without his product we would all be in a lurch?
Who has a heathen idol which he designates research?
Who tints the creeks, perfumes the air, and makes the landscape drear?
The stink-evolving, grease-dissolving chemical engineer.

Who is the man that will draw a plan for everything you desire?
From a trans-Atlantic liner to hairpins made of wire,
With "ifs" and "ands," "howe'ers" and "buts" who makes his meaning clear?
The work-disdaining, fee-retaining consulting engineer.

Who builds the road for fifty years that disappear in two,
Then changes his identity, so no one's left to sue?
Who covers all the traveled roads with filthy, lily smear?
The bump-providing, rough-on-riding highway engineer.

*—Author Unknown*


Factory Authorized

PEN REPAIR SERVICE

plus complete assortment of new pen and pencil sets

★

FOLLETT'S

COLLEGE BOOKSTORE

AROUND THE CORNER ON GREEN STREET


"Can you serve company?" asked the housewife when she was hiring the maid.
"Yes, mum; both ways."
"What do you mean?" asked the puzzled one.
"So they'll come again, or stay away."

* * *

*Meek voice over the telephone: "Doctor, this is Mr. Henpeck. My wife just dislocated her jaw. If you're out this way next week or the week after, you might drop in and see her."*

* * *

A man rushed into a drugstore and asked the pharmacist what to do to stop hiccups. His answer was a slap in the face.
Shocked and angry, the stranger demanded a reason for the action.
"Well," said the pharmacist, grinning, "you don't have any hiccups now, do you?"
"No," shouted the customer, "but my wife out in the car still does."

* * *

*If you tell a man that there are 270-678,934,341 stars in the universe, he'll believe you—but if a sign says "Fresh Paint," that same man has to make a personal investigation.*

* * *

Prisoner: "Judge, I don't know what to do."
Judge: "Why, how's that?"
Prisoner: "I swore to tell the truth, but every time I try, some lawyer objects."

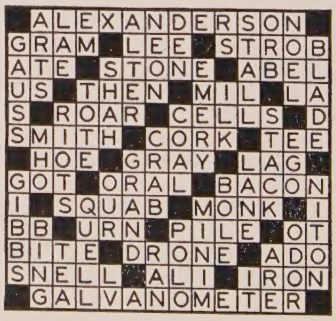
* * *

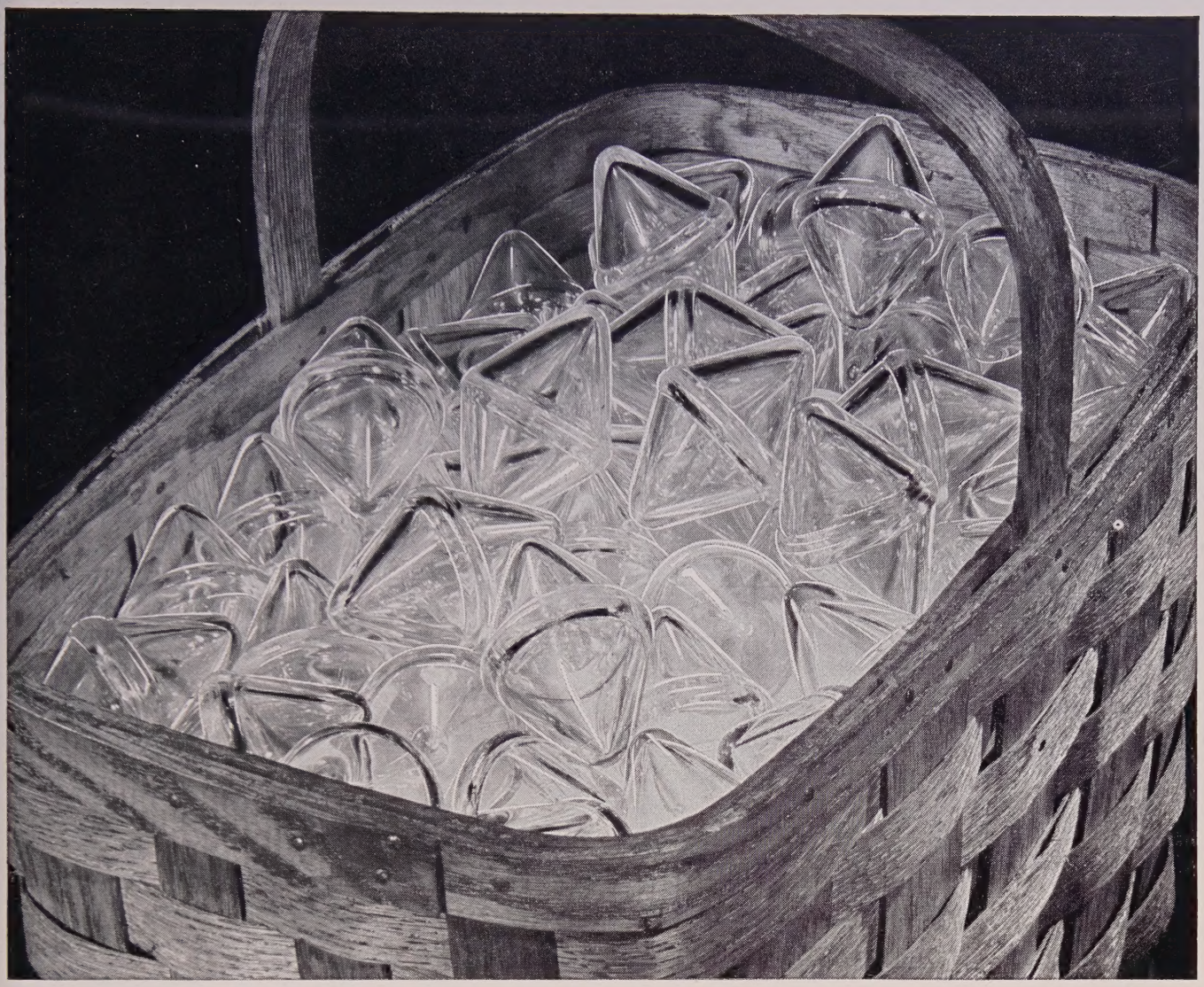
*Endeavoring to rest after an exceedingly hard day, poor father was being bedeviled by an endless stream of unanswerable questions from Willie.*
*"Whata you do down at the office?" the youngster asked.*
*"Oh, nothing!" shouted father.*
*It looked like the youngster had been put off for awhile, but not for long. For after a thoughtful pause, Willie inquired, "Pop, how do you know when you're through?"*

* * *

"You don't seem to think much of him."
"If he had his conscience taken out, it would be a minor operation."

**Crossword Answer**





# These glass eggs make TNT behave

**The traditional way** of shooting an oil well is to lower cans of nitroglycerin into the hole and explode them at the depth where traces of oil have been found.

Now, petroleum engineers, using double-ended glass cones made by Corning, can shape and direct these explosions to penetrate oil-bearing rock with a rifle-like charge.

These pointed glass eggs, with shells no thicker than a pop bottle, are set in the ends of cylinders of TNT and the charges are arranged in a case for lowering into the well.

Miraculous as it may seem, the glass egg—as it is liquefied by the explosion—acts as a gun barrel to aim the tremendous blast and concentrate it in a thin stream. The TNT charge—shooting directly outward—rips a hole in the rock to let the oil flow.

And this hole penetrates some sixteen times farther than one made by an unshaped charge.

Because they are sometimes used in wells two miles or more deep, these Corning glass charge-directors are built to withstand heavy subterranean pressures.

And although the eggs are hollow, they'll stand up under a pressure of 20,000 pounds per square inch.

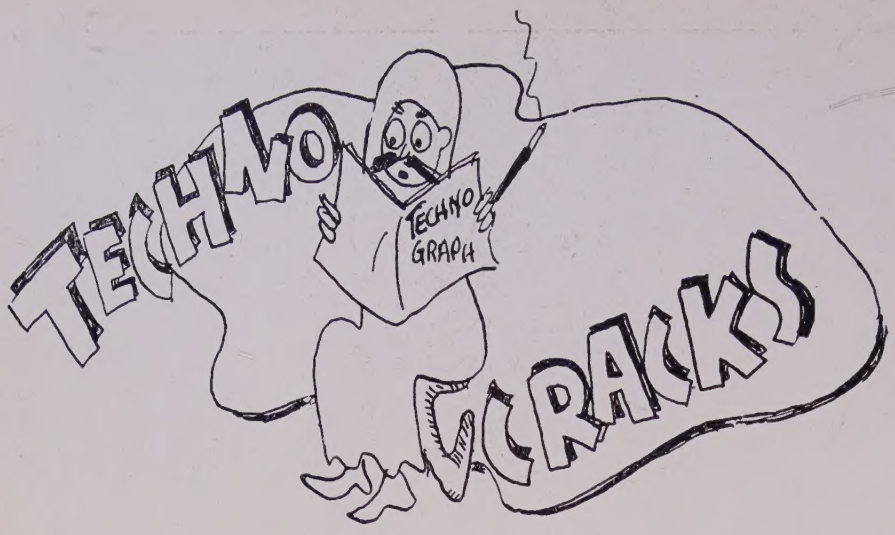
But if that seems strong to you, we'd like to point out that a one-inch cube of this same glass has a compressive strength of 250,000 pounds.

**Throughout industry**, *Corning means research in glass* because a multitude of Corning developments—such as finding ways to increase its strength—have helped make glass one of today's most versatile engineering materials.

You'll find—when you're out of school and concerned with planning new products and processes, or changes in old ones—that it's a good thing to keep *glass* in mind.

Then, we hope you'll call in Corning before your planning reaches the blueprint stage—to learn how this material, which has so many varied uses, can best serve you. *Corning Glass Works, Corning, New York.*

**CORNING**
**means research in glass**




*Two sweet young things were discussing affairs of the heart. "So you've accepted Ralph?" said one avidly. "I suppose he didn't happen to mention that he had previously proposed to me?"*

*"Well, not exactly," replied the other blandly, "but he did confess that he'd done a lot of silly things before he met me."*

* * *

"Doing some shopping?"

"Yes, I'm trying to get something for my wife."

"Had any offers?"

* * *

"Do you know Lincoln's Gettysburg address?"

"No, but in Washington it was the White House."

* * *

*A naughty boy was brought before the principal for telling his teacher to hie straight to the hot place. The principal explained that such language could not be tolerated, but if he would apologize, the teacher might give him another chance.*

*The boy was obdurate, but finally agreed to make it right. "Miss Munson," he conceded, "you don't have to go there yet."*

* * *

Teacher: "Johnny, what is wrong with this sentence, 'Girls is naturally better looking than boys'?"

Johnny: "Girls is artificially better looking than boys."

* * *

"You know, dear, John doesn't seem to be as well dressed as he was when you married him."

"That's funny. I'm sure it's the same suit."

* * *

Judge: "Couldn't this case have been settled out of court?"

Defendant: "Yer honor, shure an' that is exactly what we wuz tryin' to do whin a couple av police butted in."

Mike: "That's a queer pair of stockings you have on, Pat—one red and the other green."

Pat: "Yes, and I've got another pair like it at home."

* * *

*Friend, to policeman who had formerly been a salesman: "How do you like the new job?"*

*Policeman: "Swell—the pay is good, the hours okay, and the customer is always wrong."*

* * *

Fred: "I suppose you think I'm a perfect idiot?"

Ned: "Oh, none of us is perfect."

* * *

*Mother: "Come here, Johnnie, I have some good news for you."*

*Johnnie (without enthusiasm): "Yes, I know; father is home again."*

*Mother: "Yes, but how did you know?"*

*Johnnie: "My bank won't rattle any more."*

* * *

"I'm sorry—I forgot your party the other evening!"

"Oh, weren't you there?"

* * *

*"Look here, waiter, is this peach or apple pie?"*

*"What does it taste like?"*

*"It tastes like glue."*

*"Then it must be apple pie because our peach pie tastes like putty!"*

* * *

"This is an ideal spot for a picnic."

"Yes, it must be. Fifty million insects can't be wrong."

* * *

*Officer (to man pacing sidewalk at 3 a. m.): "What are you doing here?"*

*Gentleman: "I forgot my key, officer, and I'm waiting for my children to come home and let me in."*

* * *

Some people are like blotters—soak it all in, backwards.

A millionaire, as he climbed into his limousine, snarled at a newsboy, "No, I don't want to buy a paper!"

"Well, keep your shirt on, boss," the newsboy answered; "the only difference between you and me is that you are making your second million, while I'm still on my first."

* * *

*When Noah sailed the waters blue, he had his troubles same as you. For 40 days he drove the ark before he found a place to park.*

* * *

A man was filling out an application blank for a job, and came to the question: "Have you ever been arrested?" His answer was "No."

The next question, intended for those who answered the preceding question in the affirmative, was "Why?" Nevertheless, the applicant answered it with, "Never got caught."

* * *

*A mountaineer took his son to a school to enroll him.*

*"My boy's arter learning', what dya have?" he asked the teacher.*

*"We offer English, trigonometry, spelling, etc.," she replied.*

*"Well, give him some of that thar trigernormetry; he's th worst shot in the family."*

* * *

Sign outside a Minnesota cross-road town: "Speed limit 50 *mph.* You can't get through here any to fast for us."

* * *

*When Santa Claus met Joan of Arc: His car and her car met head on. Both drivers got out, and, with that fine courtesy so characteristic of motorists nowadays, both began to apologize.*

*"I'm so sorry," and the woman; "it was all my fault."*

*"Not at all, madam," the man responded with a gallant gesture; "I was to blame, myself."*

*"But I insist the fault was mine. I was on your side of the road."*

*"That may be true, but, my dear madam, I am responsible for the collision. I saw you coming blocks away, and had ample opportunity to dart down a side street."*

* * *

And there was the man who called a spade a spade until he stumbled over one in the dark.

* * *

*"Is a ton of coal very much, papa?"*

*"That depends, my son, on whether you are shoveling or buying it."*

* * *

Opportunity doesn't knock these days; it rings the phone and asks a silly question.

* * *

*He who parades his virtues seldom leads the procession.*